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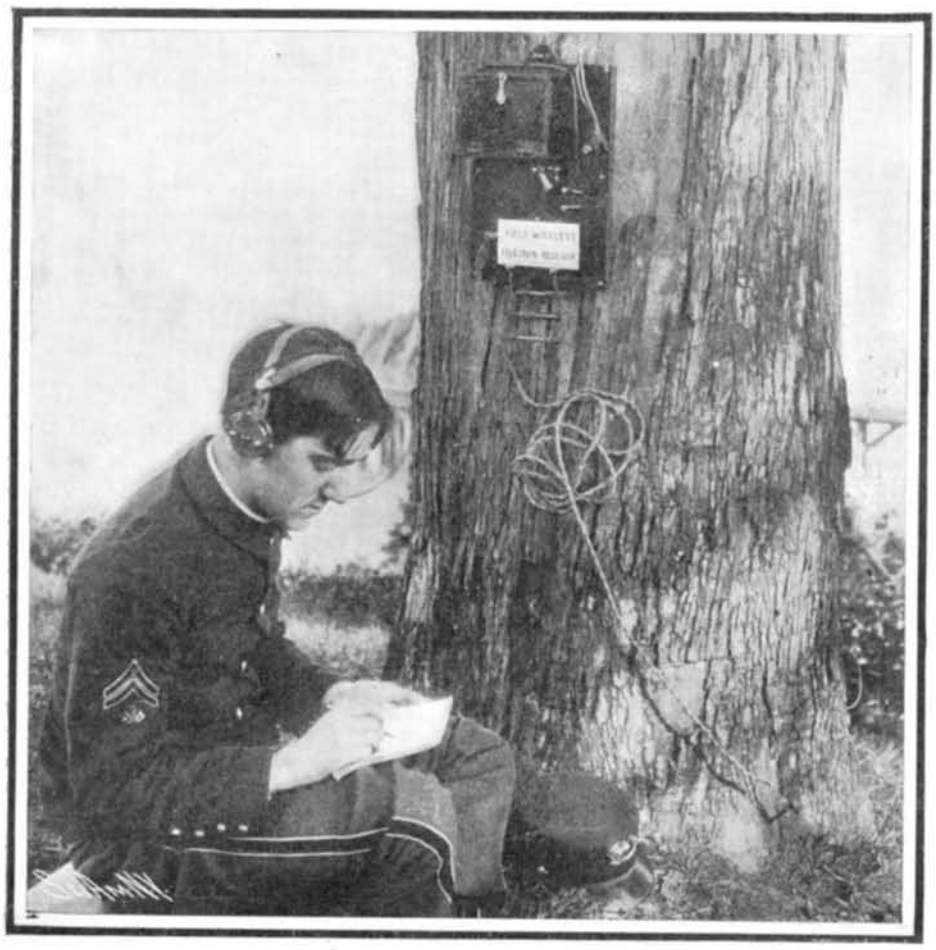
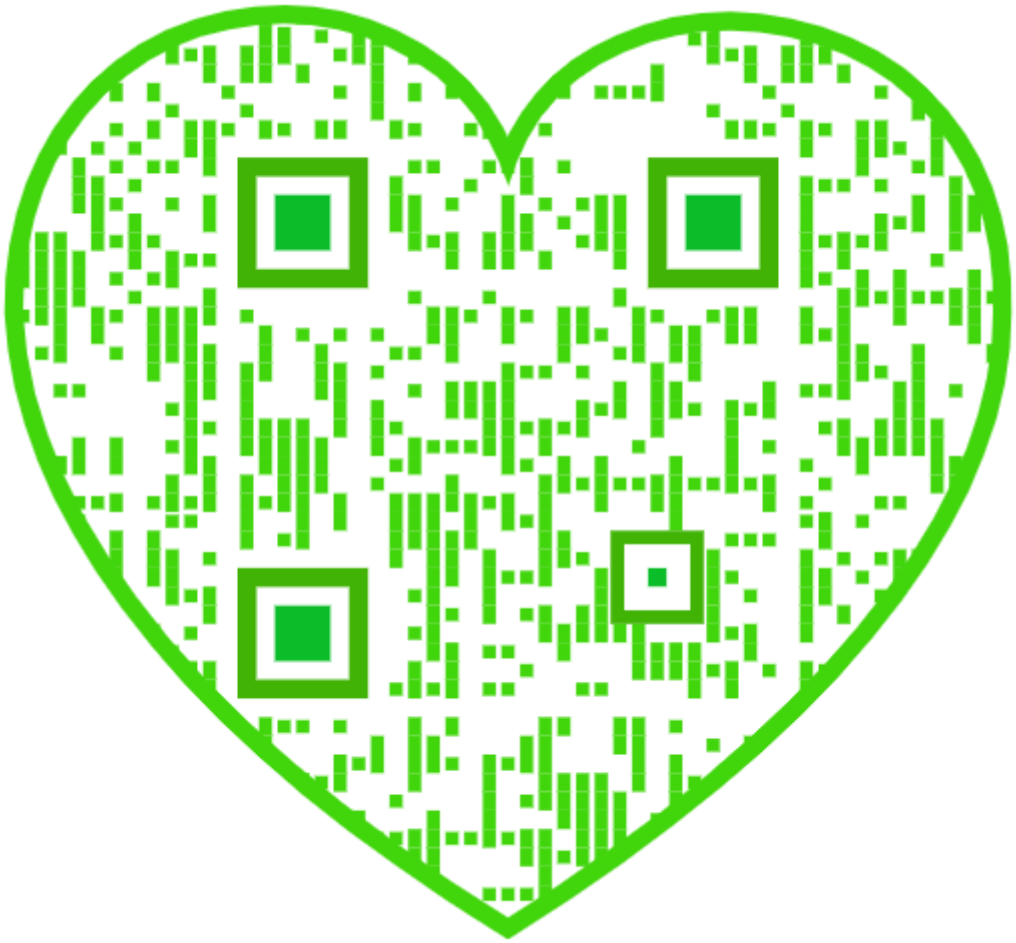


Receiving Wireless Messages at Fort Mason, California, From Yerba Buena Naval Station. Eucalyptus Tree as Antenna.

Temporary Automobile Wireless Transmitting Station Used in Major Squire's Experiments.

Temporary Field Automobile Wireless Telegraph Car Used by the United States Army.

MAJOR SQUIRE'S METHOD OF USING TREES AS ANTENNÆ IN WIRELESS TELEGRAPHY.—[See page 123.]



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NEW YORK, SATURDAY, FEBRUARY 11, 1905.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

CLOSING OF THE CROTON DAM.

The Croton Dam, which in some respects is the most notable among the large storage reservoirs of the world, was closed at 2 P. M. on January 28, by the shutting down of the gates controlling the two four-foot pipes, through which the Croton River had been flowing through the dam during the last few weeks of construction. Although the whole length of the dam has not been carried up to its full height, it is so far completed that by no possibility can the water rise at such a speed as to overtake the progress of the masonry to the level of the crest of the spillway. The incompleted portion is at the southerly end of the dam, and represents that section which was originally designed to be built of earth with a central core wall. The task of pulling down this portion of the dam and rebuilding it to conform to the solid masonry section has been carried through with great expedition under the present Chief Engineer, Mr. J. Waldo Smith, new methods of building the masonry having been employed, which have resulted in the bringing of this greatly-delayed work rapidly to its final completion. It will not take many months to fill the great reservoir to its full level, when there will be a depth of 160 feet of water at the dam itself. The lake thus formed will back up the Croton Valley for a distance of over 15 miles, and will present a shore circumference of 70 miles. When the reservoir is full, the water will rise over 30 feet above the crest of the old Croton Dam farther up the valley, and the total amount of water impounded will be 32,000,000,000 gallons. If the rainfall of the next few months should be normal, there will be about 4,500,000,000 gallons excess of inflow into the dam per month above the amount drawn off monthly by the aqueduct for the use of New York city.

VALUE OF THE TOWING TANK.

We do not suppose that even the most consistent follower of the old rule-of-thumb methods of ship modeling doubts any longer the value of the experimental towing tank or model basin, in determining the best under-water form of ships. Perhaps the only occasion on which model tank data has proved deceptive was that of the famous yacht races between the "Columbia" and "Shamrock II." Mr. Watson, it will be remembered, designed the "Shamrock" largely upon results obtained in towing a large number of models of varying form in the tank of the Denny shipyard. Mr. Herreshoff made no use of tank experiments, and great expectations were based upon the more scientific method that was supposed to have characterized the design of the challenging yacht of that year. The first attempted race was indecisive; but "Columbia" pulled out such a long lead that she seemed to have established, thus early in the contests, a pronounced superiority over "Shamrock." Rumor has it that as Mr. Watson was contemplating, somewhat thoughtfully, the rapidly-widening distance between the two boats, a friend asked him what he thought of the prospects; to which he replied, "I wish that Mr. Herreshoff had a tank." The story is good enough to be true; at least as applied to yachting. The work that is being done at the model basin at Washington is spoken of in strong terms of approval by the Chief of the Bureau of Construction and Repair in his annual report. As an instance of the great value of these experiments to our navy, it may be mentioned that the Chief Constructor states that in the preparation of the design of the new scouts, of which we give an illustration on another page, the information obtained from the model basin was invaluable; since for such vessels, not only the shape, but the length for a given speed, is a matter of great importance. Thus it was found that a scout of 4,000 tons displacement, 350 feet in length, required, in order to make 26 knots, more than double the horsepower of a vessel of the same displacement, but made narrower and shallower, and stretched to 450 feet in length. There is absolutely no method known by which such information can be obtained except through the model basin; and without it, the Bureau would be working largely in the dark concerning the majority of the problems of resistance and propulsion which require solution in the course of its work.

GROWING INTEREST IN FOREST PRESERVATION.

All of us who are concerned at the reckless way in which the magnificent forests of the United States are being cut down by the lumberman's ax, or burned up by forest fires, started by the carelessness of the settler and the hunter, will be pleased to take note that the National Forest Congress recently held at Washington, D. C., was attended by over eight hundred delegates, representing all sections of the country. It has taken time to stir the public up to an appreciation of the magnitude of this question; but it certainly does look as though we had reached, at last, a point where the public conscience has been thoroughly aroused, and the parties who are more particularly and immediately interested in the question are throwing their interest and powerful influence into the scale. Evidence of this was seen in the fact that leading railway officials, well-known lumbermen, managers of mines, and cattlemen and farmers were present in large numbers at the congress. This is as it should be. Time was when the interest in forest preservation was confined to people who had no practical connection with forestry, and were, therefore, drawn to the subject more by sentimental and philanthropic motives than by those of a practical character. At the recent congress, however, the most severe denunciation of forest spoliation came from the men who are interested in the preservation of our forests for practical and personal reasons.

STRENGTH OF PRESERVED TIMBER.

The increasing use of timber, that has been subjected to chemical treatment to preserve it against fire or decay, has led the Bureau of Forestry to make a series of tests for determining the effect which the fireproofing and preservative processes have upon the strength of the timber. Although these are not the first tests of the kind to be made, they are the first in which an effort has been made to determine how much the decrease in strength was due to the preliminary steaming process to which the material is subjected, and how much to the subsequent impregnation with creosote or preservative salts. For carrying out these tests, the Bureau put up a complete plant at the St. Louis Exposition, and the preliminary statement of the results which has appeared will have great interest for all workers in wood, whether in the large pieces used by the bridge and house builder, or in other structural work of a lighter character. Briefly stated, the method adopted was to use an 11-foot timber, which was first subjected to the preliminary steaming. Three-foot sections were then cut from each end, and the remaining 8 feet was treated with the preservative. Test pieces were then taken from the 3-foot steamed sections and the 8-foot steamed and preserved section for comparative tests. It was found that the steaming process diminished the strength of the timber in about direct proportion to the length of time that the steam was applied. There was a diminution of strength of 10 per cent when a pressure of 20 pounds was applied to the timber for four hours, and a diminution of strength of 25 per cent after a 20-pound pressure had been applied for ten hours, the variety of timber employed for the test being green "loblolly" pine. When a steam pressure of 50 pounds to the square inch was applied for four hours, there was diminution of strength of 25 per cent. Every worker in wood that is subjected to structural stresses will agree with the finding of the test committee when it states that it is well to avoid, if possible, the use of these preliminary steaming operations in the wood-preserving industry.

The tests further proved that the loss of strength is to be charged solely to the steaming, and not to the preservatives themselves. Thus, the strength of timber treated with a 2½ per cent solution of zinc chloride, subsequent to the steaming of the timber, proved to be the same as that of the steamed but untreated timber; and the same result was obtained with timber treated with an 8 per cent solution. The treatment with creosote has about the same weakening effect upon the timber as if it were treated with the same amount of water. In other words, creosoted and green timber have about the same strength; but with this important difference, that green timber gains strength as it seasons, whereas the creosote remains liquid in the timber. This has been proved by the analysis of a thirty-five-year-old creosoted pile.

A DESIGN FOR TURBINE CRUISERS.

The former Chief Constructor of the United States Navy, who is now the president of a large shipbuilding company, recently put in a bid for a 14,000-ton armored cruiser equipped with turbines. The proposition will attract worldwide attention, both because of the fact that it is made by the man who, more than any other, is responsible for the designs of the new United States navy, and also because of the daring nature of the proposition. Hitherto the largest warship to which the steam turbine has been applied is the "Amethyst," a 3,000-ton cruiser of the British navy. Mr. Bowles has always shown a disposition to be conservative rather than radical, in the matter of new design, and it is very significant that he should have been so perfectly satisfied with the performance of the new type of engine, as to be willing to commit his company to the venture of installing it on a big warship, whose estimated cost was over four million dollars. Furthermore, the faith of that growing school of naval architects and engineers who believe that the turbine is the coming motive power in all classes of ships except those that are intended to travel at very low speed, has received a strong indorsement in the comparative steam trials of the turbine-driven "Amethyst" and the sister ships of the same class, driven by reciprocating engines, a full account of which was given recently in our editorial columns. It will be remembered that, for speeds above 14 knots, the turbine showed a superior economy that increased with the increase in speed, and that with improvements to be made in the condensers of the turbine, and by leading the exhaust of the auxiliaries into the low-pressure receiver instead of into the condenser, the turbine-driven vessel is expected to show economy equal to that of the reciprocating-engine ship, at speeds considerably lower than 14 knots an hour. Incidentally, it is interesting to note that Mr. Bowles, who designed the armored cruisers "Tennessee" and "Washington," on which the "Montana" and "North Carolina" are an improvement, submitted an entirely different plan for the location of the secondary battery. The change consists in raising eight of the twelve guns on the gun deck to the level of the main deck, where they are mounted, together with the four guns originally carried on this deck, in pairs in six turrets, thereby increasing the command of these guns from 14 feet 6 inches to 23 feet above the waterline. The weight saved by the installation of turbines, moreover, is allocated to the side armor, the thickness of the main armor belt being increased from 5 to 6 inches. This last improvement remedies what we have always considered to be quite a serious defect in the design of the armored cruisers of this class.

OPENING OF DINOSAUR HALL OF THE AMERICAN MUSEUM OF NATURAL HISTORY.

Eight years ago the American Museum of Natural History of New York city began a search for fossil reptiles in the Rocky Mountain States. The prime object of the search was to obtain skeletons of the Dinosaurs, those gigantic extinct animals whose fragmentary remains, discovered in that region and studied and described especially by the late Prof. Marsh, have excited the greatest interest among men of science. In order to place these marvels of an antique world before the public in tangible form, a Dinosaur Hall was planned, in which should be exhibited mounted skeletons of the principal kinds of these creatures. To obtain them, a series of expeditions into the regions of the arid West, where such fossils are to be found, was inaugurated and carried on under direction of Prof. Henry Fairfield Osborn, and the collections of the late Prof. Cope, containing three splendid skeletons of Dinosaurs, were purchased through the liberality of President Jesup.

This programme involved an amount of work hardly to be appreciated by outsiders, and it is yet far from complete. Nevertheless, the mounting of the largest skeleton, the Amphibious Dinosaur *Brontosaurus*, has been completed, the skeleton of a remarkable dwarf Dinosaur, the "Bird-Catcher," has been mounted and placed on exhibition, the preparation and mounting of complete skeletons of three other large and very extraordinary types (the Carnivorous, Duck-billed and Plated Dinosaurs) are well under way, and diligent search is being made for complete and mountable skeletons of other important kinds. Many other less complete specimens have been found, some of which are exhibited in the wall-cases around the hall.

The Dinosaur Hall will be opened to the public on February 16, 1905. The chief interest, of course, centers in the giant mounted skeleton of the above-mentioned *Brontosaurus*. In this hall visitors may see the largest fossil skeleton that has ever been mounted, and besides may obtain some idea of the variety and extraordinary character of the animals which populated the earth during the age of reptiles, millions of years ago, before the age of mammals had begun or the various races of quadrupeds which inhabit the world commenced their evolution.

In the issue of January 21, 1905, the SCIENTIFIC AMERICAN published an account of the mounting of the *Brontosaurus*; a few additional facts at this time may be of interest to the reader.

It will be remembered that the collection, preparation, and mounting of this enormous fossil has been a

task of extraordinary difficulty. No museum has ever attempted to mount so large a fossil skeleton, and the great weight and fragile character of the bones made it necessary to devise special methods to give each one a rigid and complete support, as otherwise it would promptly break in pieces from its own weight. The proper articulating of the bones and the posing of the limbs were an equally difficult problem, for the Amphibious Dinosaurs disappeared from the earth so long ago that their nearest living relatives, the lizards, crocodiles, and so forth, are extremely remote from them in either proportions or habits, and consequently they are very unsatisfactory guides in determining how the bones were articulated, and of but little use in posing the frame in positions that were probably taken during the creature's life.

So far as the backbone and ribs were concerned, the articulating surfaces of the bones were a sufficient guide to enable the experts to pose this part of the skeleton properly; but the limb-joints are so imperfect that it was not possible in this way to make sure of having the bones in a correct position. Therefore the following method was adopted: A dissection and thorough study was made by Dr. W. D. Matthew of the limbs of alligators and other reptiles, and the position, size, and action of the principal muscles carefully worked out. Then the corresponding bones of the *Brontosaurus* were studied, and the position and size of the attachments of the corresponding muscles marked out so far as they could be recognized from the scars and processes preserved on the bone. The limbs were then provisionally articulated and posed, and the position and size of each muscle represented by a broad strip of paper extending from its origin to its insertion. The action and play of the muscles on the limbs of the *Brontosaurus* could then be studied, and the bones adjusted until a proper and mechanically correct pose was reached.

The *Brontosaurus* was one of the largest of the Amphibious Dinosaurs, or Sauropoda, a race of gigantic reptiles which flourished during the Jurassic or Middle Period of the Age of Reptiles—some eight millions of years ago by a moderate estimate of geological time.

As mentioned in the previous writing, the construction of the vertebræ is truly remarkable; it can best be seen in the unmounted skeleton of *Camarasaurus*, another amphibious Dinosaur which has been laid out on tables beside the *Brontosaurus*.

Three views or opinions as to the habitat of Amphibious Dinosaurs have been held by scientific authorities. The first, advocated by Prof. Owen, who described the earliest specimens found forty years ago, and supported especially by Prof. Cope, has been most generally adopted. It regards these animals as spending their lives entirely in shallow water, partly immersed, wading about on the bottom, or perhaps occasionally swimming, but unable to emerge entirely upon dry land. More recently Prof. Osborn has advocated the view that they resorted occasionally to the land for egg-laying or other purposes; and very recently the view has been taken by Mr. Riggs and the late Mr. Hatcher, that they were chiefly terrestrial animals. Dr. Matthew, who has made as close a study as possible of the anatomy of the Dinosaurs, particularly in connection with the mounting of the *Brontosaurus*, inclines to the view of Owen and Cope, whose unequaled knowledge of comparative anatomy renders their opinion on this doubtful question especially authoritative.

The brain case occupies only a small part of the back of the skull, so that the brain itself must have been small even for a reptile, and its organization (as inferred from the form of the brain-cast) indicates a very low grade of intelligence. Much larger than the brain proper was the spinal cord, especially in the region of the sacrum, controlling most of the reflex and involuntary actions of the huge organism. So that we can best regard *Brontosaurus* as a great slow-moving animal-automaton, a vast storehouse of organized matter directed chiefly or solely by instinct, and to a very limited degree, if at all, by conscious intelligence. Its huge size and its imperfect organization, as compared with the great quadrupeds of to-day, rendered its movements slow and clumsy; its small and ow brain shows that they must have been automatic, istinctive, and unintelligible.

TWENTY THOUSAND DOLLARS FOR NEW INTERNATIONAL RACE.

The recent decision of the French Automobile Club regarding the Gordon Bennett Cup race and the founding of a new International Cup with a $20,000 prize, has awakened a considerable sensation. The present rules for the Gordon Bennett Cup are especially unfavorable to the French constructors, seeing that there are only three entries for each nation, and thus the French industry, which is represented by a great number of constructors, is placed on a par with nations having but a few leading makes. In this case France is obliged to select three cars out of a great number by eliminating trials, while another nation in which the industry is much less developed can also enter three cars, probably all of the same make. This year France is obliged to enter the Cup race under the existing rules, seeing that it now holds the Cup and is bound by its engagement. However, the Automobile Club decided that it would establish a new International Race which is to be run at the same time as the cup. These conditions hold good for 1905, but next year will see the condition of affairs considerably modified. There is no longer any engagement to fulfill, and the club decided that the rules for the cup race must be considerably changed to give a better chance for the constructors, or else it will not take part in the race. At the same time it establishes a race which will admit a greater number of competitors, and it will be known as the Grand Prize of the Automobile Club of France. It will no doubt become the leading event of the year. The club voted the Auvergne Circuit in the central part of France for this year's eliminating trials and the Cup Race. This is an elliptical circuit about 350 miles long. Immediately following the decision of the club, the journal L'Auto of Paris offered the sum of 100,000 francs ($20,000) to endow the Grand Prize, so that the event will be of great interest. The prize is to be awarded to the constructor of the winning car. It is probable that the race, which now includes the Cup and the Grand Prize, will be run in the latter part of June or the first of July. The following nations will no doubt be entered: France, Switzerland, America, Italy, Germany, Austria, Great Britain. As to the Grand Prize, it is probable that the Club will ask the leading constructors of different nations to take part, and there may be 42 entries in all, including the 21 for the Cup Race and an equal number chosen by the Club, with 12 from France.

SOME NEW COOPER HEWITT INVENTIONS.

Six new inventions have been patented by Mr. Peter Cooper Hewitt. Patent No. 781,606 covers a method for producing oscillating currents. Briefly, it is a method to prevent some of the loss in the spark gap of a wireless telegraph or other oscillatory system. To this end an auxiliary oscillator is provided, which is designed and arranged in such relation to the prime oscillator that the latter transfers all, or at least a large fraction, of the energy of the prime discharge to the said auxiliary oscillator. The function of this is elastically to absorb this energy in such a manner that it will oscillate persistently in its own natural period. The auxiliary oscillator has no spark gap, and oscillations therein once initiated will persist much longer than is the case where all the energy must cross a spark gap twice for each complete oscillation.

Patent No. 780,997 covers various forms and arrangements of the apparatus for producing oscillatory currents by the above method.

Patent No. 781,605 covers a method for producing light. This is substantially the method employed in the well-known Hewitt mercury-vapor lamps, with the difference that while in the earlier patent the vapor in the gap between the electrodes was made luminous by a flow of current of given value at a certain potential, the purpose in the present instance is to affect the gas or vapor by an intermittent flow of a current of practically the same value but of higher potential, the energy represented by the intervals between the impulses being intermittently withdrawn from action and reappearing in the form of an increased quantity in the rapid periodic currents. By the passage of current the voltage is lowered to a point where the usual resistance to starting reforms, whereupon the checked current rebuilds or re-establishes itself, its electrical pressure rising until the breaking-down pressure is again attained, after which the same succession of actions is repeated. The result is an increased brilliancy on the part of the lamp, due to this increased consumption of energy per unit of time, while the effect upon the eye becomes that of a light due to a continuous flow of current of greater quantity.

Patent No. 780,998 covers an apparatus for starting electric lamps. It is for the purpose of producing the initial and temporary high potential necessary to start the flow of current through vapor lamps of this kind. Briefly, it consists of a transformer having two coils connected with each other, one coil being permanently in series with the lamps, and the other in shunt upon the source. Means are provided for closing and opening the circuit of the second coil for inducing a higher potential in the series coil. There is an electro-magnet in series with the lamp and the last-named coil, and an armature for the electro-magnet. This armature is normally included in the circuit of the shunt coil, whereby on the passage of current through the lamp, the circuit of the shunt coil is opened.

Patent No. 781,002 covers a method of amplifying electrical variations. The resistance of an inclosed vapor or gas carrying current in an electric circuit varies inversely with the current carried by the vapor. Accordingly, if a varying potential be applied, a variation of current will take place in the inclosed vapor or gas, and this variation will affect the entire circuit. If the circuit is so arranged that the gas or vapor apparatus represents a considerable portion of the total resistance, the variations of current thus caused in the conducting gas will cause comparatively large variations in the entire circuit. As the practical result of an increase of applied potential is an increased flow of current, the original electrical impulses in the circuit may produce magnified effects as compared with those which the same impulses would produce if applied directly to the receiver.

Patent No. 781,001 covers a means for amplifying electrical variations. Substantially, this consists of an electric circuit including a source of potential variations, a receiver adapted to respond to changes of current in the circuit, and an inclosed gas or vapor conducting medium.

Patent No. 780,999 covers a method of transforming electrical energy. This consists in producing intermittent or vibratory electric currents in a successively charged and discharged circuit, which contains a circuit controller which has a high initial resistance and possesses the quality of taking no current below a definite low limit of electromotive force. It consists in periodically impressing upon the circuit an electromotive force higher than that at which the controlling device starts, and successively opposing to the electromotive force thus impressed upon the circuit, the high initial resistance of the circuit controller, and a predetermined lower resistance. The application of the lower resistance is continued through a definite period until the lowermost operative limit has been reached, and then this cycle of operations is repeated. The circuit controller above mentioned consists of an inclosed vapor or gas which possesses the initial high resistance and the consequent definite low resistance after the current has once broken a path through it.

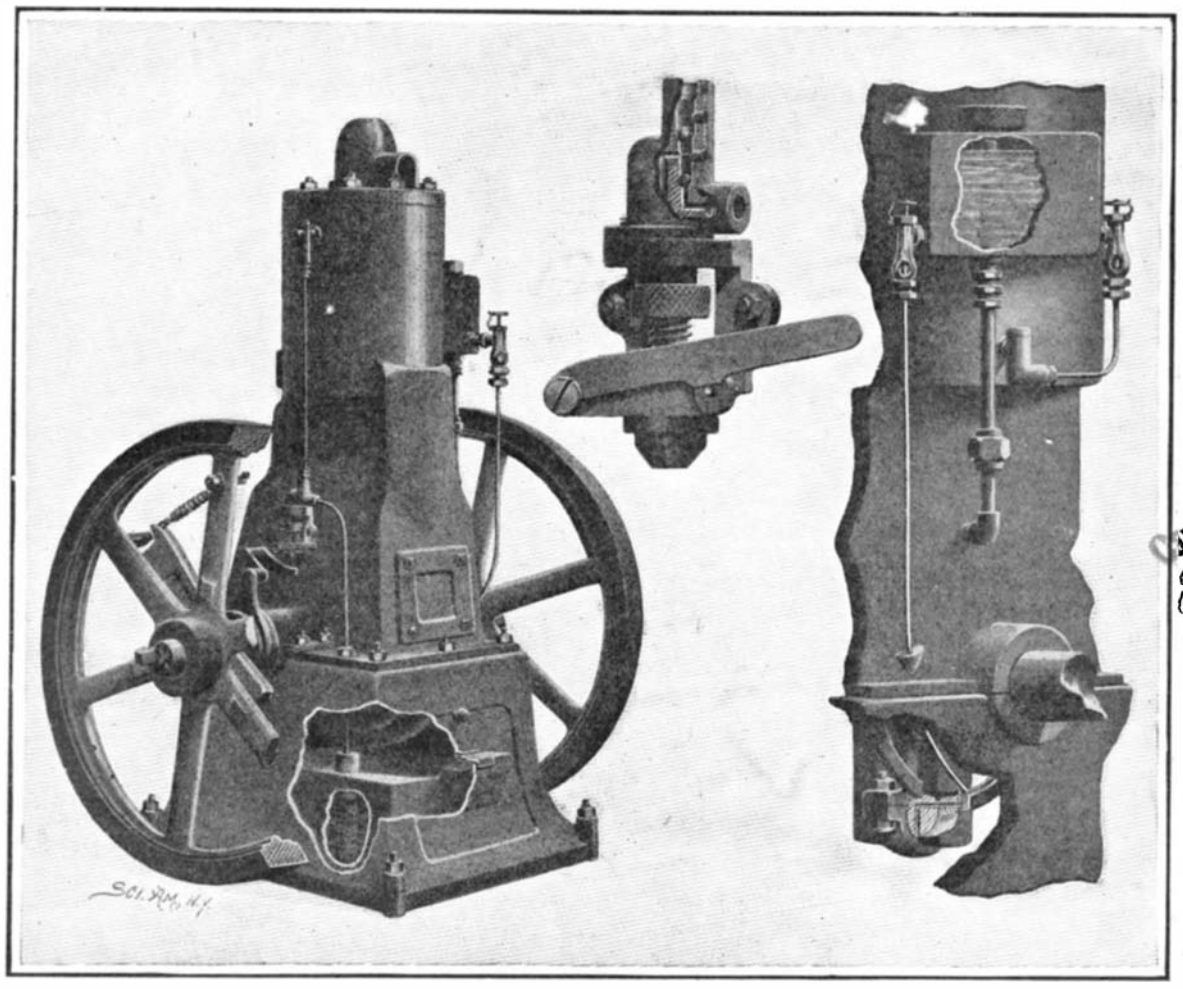
Patents Nos. 781,000 and 781,603 cover apparatus for transforming electrical enrgy. Substantially, this consists of a gas or vapor lamp, such as that invented by Mr. Hewitt, in combination with a source of electric currents, and means for periodically applying to the terminals of the lamp differences of potential varying from the higher, initial, starting potential of the lamp to a value less than the potential at which the lamp remains conductive.

PRIZES FOR ESSAYS ON CEMENT.

In June last the Prussian minister of public works, jointly with the Prussian ministers of war, agriculture, and trade and industry, the imperial secretary of the navy, and the German Society of Portland Cement Manufacturers, issued a call for a prize competition of scientific essays on the chemical processes which take place during the hardening of cements. Prizes to the amount of 15,000 marks ($3,570) are offered, and the prospectus specifies that contributions must be submitted in the German language, each signed with a pseudonym, and the name of the author inclosed in a sealed envelope marked with the same pseudonym, which latter will be opened only in case the paper bearing such pseudonym receives a prize. Thus prepared, all papers for competition are to be addressed to the "Ministry of Public Works, No. 80 Wilhelm-Strasse, Berlin," where they will be received until 3 P. M. December 31, 1906. The papers, immediately after the lists are closed, will be submitted to a jury composed as follows: Prof. Dr. Van Hoff, Berlin; Prof. Dr. Scheibe, Wilmersdorf; Dr. Michaelis, Berlin; E. Cramer, editor of the Clay Industry Journal, Berlin; Prof. Dr. Wilhelm Fresenius, Wiesbaden; Director Friedrich Schott, Heidelberg; Dr. H. Passow, Hamburg, and officials of the royal testing station near Berlin. The scope of the investigation is indicated by the following schedule which defines the questions to be solved: "Demonstration of the properties and of the hardening process of calcareous hydraulic cements synthetically, analytically, microscopically, mineralogically (hardening in air, fresh water, and sea water). (a) To prove whether silicic acid, alumina, and oxide of iron combine with lime as crystalloids in stable proportions, or as colloids in varying proportions. (b) To prove whether double combinations result between silicic acid, alumina, and oxide of iron with lime and in what manner these substances are engaged in the hardening process. (c) Consideration of the swelling phenomenon which accompanies the hydraulic hardening. (d) Consideration of the influence of the temperature and length of time of the burning process on the different kinds of hydraulic cements. (e) Properties of puzzolana and its hardening with lime; beginning with silicic acid as the most active and prevailing puzzolana, alumina, oxide of iron, and manganese, independent and in combination with silicic acid, as natural or artificial puzzolana. The competitors may choose for the purpose of investigation any or all of the foregoing questions.

A COMPACT AND ECONOMICAL KEROSENE ENGINE.

There is a growing demand on the part of the users of engines of moderate horse-power for a light motor, that will occupy little space, can be quickly started and stopped, that is simple in its construction and operation, is thoroughly reliable, and above all that will yield its rated horse-power, day in and day out, with a reasonable economy of fuel. The accompanying drawings illustrate the most important features in a kerosene engine in which a successful effort has been made to meet the above requirements. The engine is simple in construction. It consists of a cast-iron base, reaching to the center of the crank-shaft, in which is placed a galvanized-iron kerosene tank holding enough oil for a whole day's run. To avoid the inconvenience of having to withdraw the tank for filling, a projection is cast on the side of the base and provided with a lid, on lifting which, the kerosene may be poured direct into the funnel of the tank. The crank-case and cylinder casting is bolted upon the base, and the whole can be readily taken apart at any time for inspection. Reliability and economy in running are assured by the use of a positive feed of oil, the supply being controlled by a force pump, operated from an eccentric, which is controlled by the flywheel governor. The device is so adjusted that the feed of oil is always proportionate to the load. Under full load and low speed, the eccentric gives a long stroke to the plunger; as the load lightens and the speed rises, the stroke shortens and the feed of oil is proportionately reduced. This is directly in line with the best steam-engine practice, in which the governor acts directly on the cut-off. Careful electrical tests have shown that the supply of oil is directly proportional to the work to be done; and as this regulation of the supply is automatic, a constant economy is assured. Particular care has been given to the design and construction of the pump. It is provided with steel ball valves, seating on phosphor bronze. The action is positive, and the many troubles which come from the use of spring-adjusted valves are quite avoided. The action of this mechanism is so sensitive that the interposition of a sheet of tissue paper between the eccentric lever and the plunger will produce instant increase in the speed of the engine. One of the sectional views shows the ingenious method of forced lubrication. A small pipe leads from the compression chamber to an oil tank attached to the cylinder, the top of the pipe terminating near the roof of the tank and clear of the surface of the oil, which is thus subjected to a pressure equal to that in the crank case. The oil is forced through two sight-feeds, one of which leads to the crank-pin, and the other to the cylinder and wrist-pin. The crank-pin oiler consists of a ring of channel section, which is set concentrically to the crank-shaft and eccentrically to the crank-pin, to which latter it is attached. A hole passes from the side of the oiling-ring into a hole bored through the crank-pin and communicating with oil channels in the wearing surface of the pin. As the engine revolves, centrifugal force retains the oil in the ring and forces it through the oil hole onto the wearing surfaces. The engine is adapted to use the ordinary grades of commercial kerosene; and the electrical tests, to which we have already referred, show that the larger engines of this type run on a consumption of somewhat less than one pint of oil per horse-power per hour, and that the smaller sizes show an economy that is proportionately good. The engine is manufactured by the Universal Kerosene Engine Company, 137 Liberty Street, New York.



Forced feed regulated from the flywheel governor; ball valves; forced lubrication; oil tank in base.

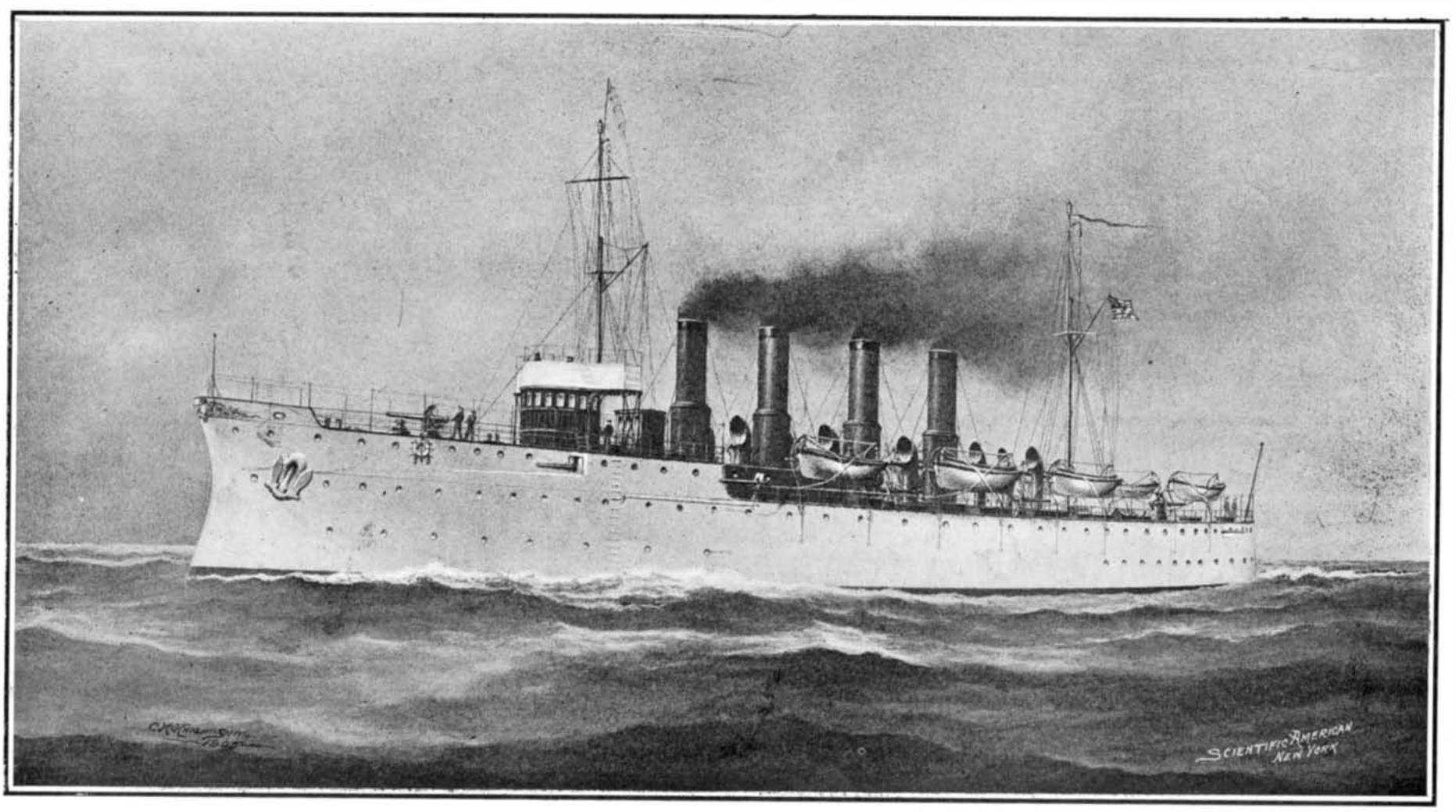
COMPACT KEROSENE ENGINE FOR ISOLATED PLANTS.

SCOUT CRUISERS FOR THE UNITED STATES NAVY.

BY LIEUT. H. C. DINGER, U. S. N.

The chief characteristics of the new 24-knot scout cruisers appropriated for in the Naval Appropriation Act of April 27, 1904, have been defined by the Board on Construction, and the development of the details of design is now in progress. The chief characteristics are as follows: Length between perpendiculars, 420 feet; breadth, 46 feet 8 inches; draft fully loaded, 18 feet 3½ inches; depth amidships, 36 feet 5 15-16 inches; displacement loaded, 4,310 tons; draft on trial, 16 feet 10 inches; corresponding displacement on trial, 3,750 tons; speed, 24 knots. The battery will consist of twelve 3-inch guns, carried on the main deck. There will be two 21-inch submerged torpedo tubes; 3,600 rounds of 3-inch ammunition and 8 torpedoes to be carried. The estimated weight of battery and full ammunition is 140 tons.

The Board at first recommended a 1½-inch inclined nickel-steel deck for the length of the machinery space, and 2-inch vertical steel protection to extend



Length, 420 feet; **Beam,** 46 feet 8 inches. **Trial Draft,** 16 feet 10 inches. **Depth Amidship,** 36 feet 6 inches. **Displacement on trial,** 3,750 tons. **Battery,** twelve 3-inch guns. **Torpedo Tubes,** two submerged. **Armor,** deck 1½-inch, side 2-inch. **Horse-power,** 16,000. **Speed,** 24 knots. **Coal Supply,** 1,200 tons.

THE NEW 24-KNOT SCOUTS FOR THE UNITED STATES NAVY.

above the tops of boilers and cylinders of the main engines, with at each end of the machinery space an athwartship 1-inch steel bulkhead. For the steering gear, nickel-steel protection 2 inches thick and 1 inch on the flat was recommended. In working up the details of the design, it developed that the inclined deck would interfere to a very great extent with proper coal-bunker arrangement and means for rapidly stowing and emptying bunkers; so that the nickel-steel protection in wake of machinery may be placed either at the ship's side, or on the fore-and-aft inclined bulkhead between bunkers and firerooms. This change will give to these vessels an efficient arrangement of coal bunkers, which will add very materially to their steaming efficiency and endurance.

The Board recommended that a design be prepared by the Department, to include twin-screw reciprocating engines, with the necessary auxiliaries, of about 16,000 maximum I.H.P.; twelve water-tube boilers; an evaporating plant of 1,600 gallons capacity per day; a refrigerating plant of two tons capacity; a general workshop; the total weight of machinery including spare parts to be 794 tons. The Board recommended that the Department ask for bids under two classes; the first to be on the Department's design without changes in hull or machinery, and the second to be with the general characteristics of hull as set forth above, but on the bidder's design of machinery, preference being given to a turbine installation.

The 3-inch guns are to be supplied by chain ammunition hoists, two forward and two aft. The vessels are to be lighted by electricity. An electric generating plant of three 32-kilowatt machines is to be installed in separate dynamo room. The ventilating blowers, deck winches, and workshop motors are also to be electrically driven. Two large searchlights are to be installed. A wireless telegraph outfit is to be supplied. This, as well as other signal apparatus, is of special importance for the particular work the scouts will be required to perform. The vessels will carry two pole masts for signaling. There will be four smokestacks, 78 feet above base line. The forecastle deck will be raised, and will extend aft as far as the forward smokestack. The freeboard will be about 34 feet forward and about 22 feet aft. The total coal capacity will be between 1,000 and 1,200 tons; coal on trial, 500 tons. Sixteen officers and a crew of 368 men are to be carried.

The development of the design of machinery installation has in contemplation the following: Twelve boilers, modified Normand type, placed in three watertight compartments, with a total grate surface of 690 square feet, and a total heating surface 38,000 square feet. At full speed the coal consumption will be about 300 tons per day. Each boiler room is to have an auxiliary feed pump piped to feed the boilers in its own compartment, to have fresh-water connections only; a fire and bilge pump piped to supply fire main and ash ejectors and for pumping bilges; an ash ejector for removing ashes while firerooms are under air pressure.

There will be twelve blower engines driven by reciprocating engines or steam turbines and located in the deck space above the boiler rooms. The blowers are to be of sufficient capacity to give an air pressure of 5 inches in firerooms. The engines are to be of the four-cylinder, four-crank, triple-expansion type, with a low-pressure cylinder at each end. The cylinders are high-pressure 28½ inches, intermediate-pressure 45 inches, low-pressure two 62 inches diameter. The stroke is 36 inches; revolutions 200 per minute, with corresponding piston speed of 1,200 feet per minute. It will be noted that the low-pressure cylinder for the corresponding power is of considerably larger proportions than has heretofore been the practice with naval engines. The larger low-pressure cylinder will allow a greater range of expansion to be used, and hence will conduce to greater economy.

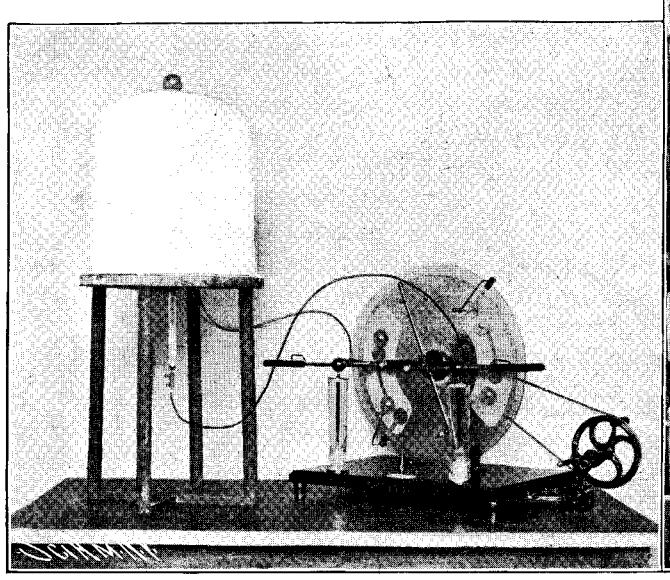


Fig. 1.—The Old Laboratory Experiment of 1884 with a Bell Jar Full of Fog Ready to be Dispersed by the Electricity Supplied by the Voss Machine, the Terminals of Which Are Connected Respectively with the Floor of the Jar and with an Insulated Point Inside.

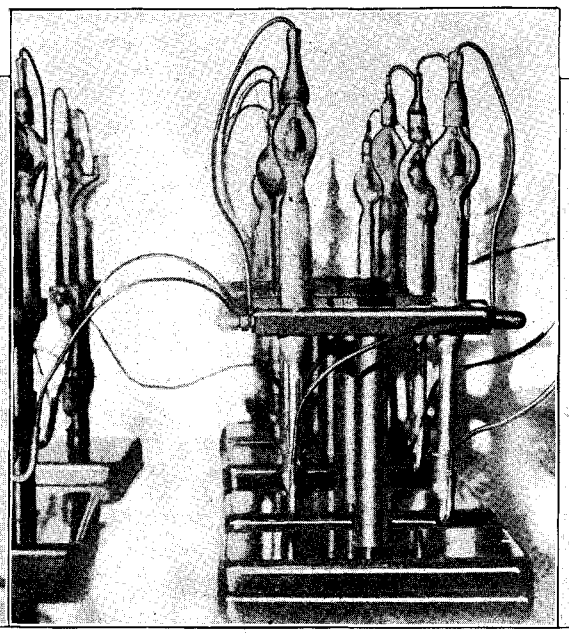


Fig. 4.—A Battery of Rectifiers Able to Stand Excessively High Potentials Without Conveying a Current in One Direction, while in the Other Direction they Transmit a Current Quite Easily.

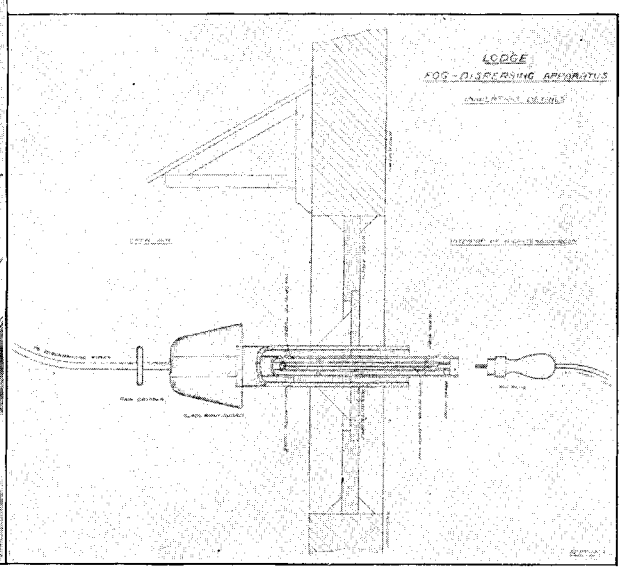


Fig. 6.—A Wall Insulator, Being the Arrangement Found Necessary for Carrying the High-Tension Leads Through a Partition and at the Same Time Enabling them to Maintain Something Like a Million Volts, even During the Damp Atmosphere of a Fog.

FOG DISPERSION BY ELECTRICITY.

BY THE ENGLISH CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

A few months ago we briefly described in the SCIENTIFIC AMERICAN the latest experiments that had been carried out by Sir Oliver Lodge in dispelling fogs by the discharge of electricity into the laden atmosphere, and the highly satisfactory results that attended the tests. Through the courtesy of the inventor, we are now enabled to describe his process, and to illustrate the apparatus employed for the purpose.

The possibility of dispersing fogs which consist of one, or both, of two things—particles of dust in various forms, or minute drops of water vapor—has occupied the attention of this scientist for the past twenty years. In 1884 Sir Oliver Lodge, acting on the observations that had been made by the late Prof. Tyndall as far back as 1870, who discovered that when a hot body is held in strongly-illuminated dusty air, a dark or dust-free space is immediately formed above it, carried out a series of electrical experiments to substantiate Tyndall's theories, and also to discover the cause of the dust-free space. At first it was suggested that the solution was that the dust was burned and destroyed, but this explanation was soon disproved by using a moderately-heated body, which was not sufficiently hot to consume the particles. The same phenomenon was observed. Dr. Tyndall, unable to ascertain any other answer to the problem, advanced the suggestion that the air was dragged up in convection currents faster than its supported dust, which was consequently left behind. And so the question rested until Lord Rayleigh took up the subject in 1881, and shortly afterward by Sir Oliver Lodge, who carried out his investigations in conjunction with the late Mr. J. W. Clark. All the known experiments were repeated with minute care, and the results were highly satisfactory. In these preliminary trials hot bodies of varying descriptions were employed, but in the course of the researches the scientist accidentally conceived the idea of testing one hypothesis that had occurred

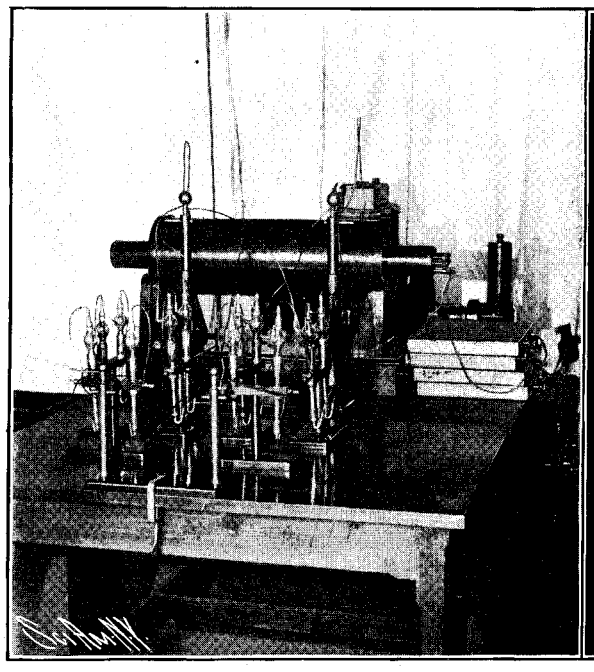


Fig. 5.—Rectifiers Connected up to a Coil Excited by an Alternating Dynamo with Condensers in Series with the Primary and Alternators so as to Get a Maximum Effect by "Tuning."

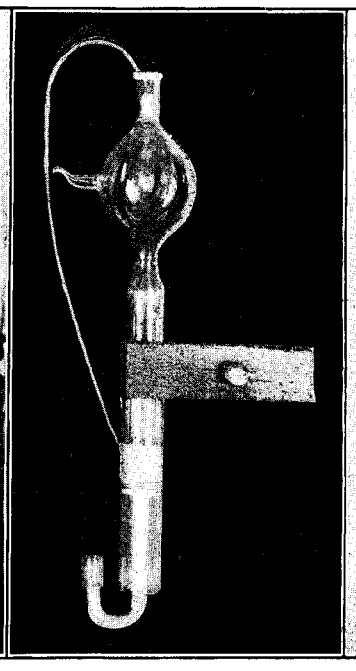


Fig. 3.—A Mercury Rectifier in a Rather Convenient Form for the Fog-Dispelling Experiments of Sir Oliver Lodge.

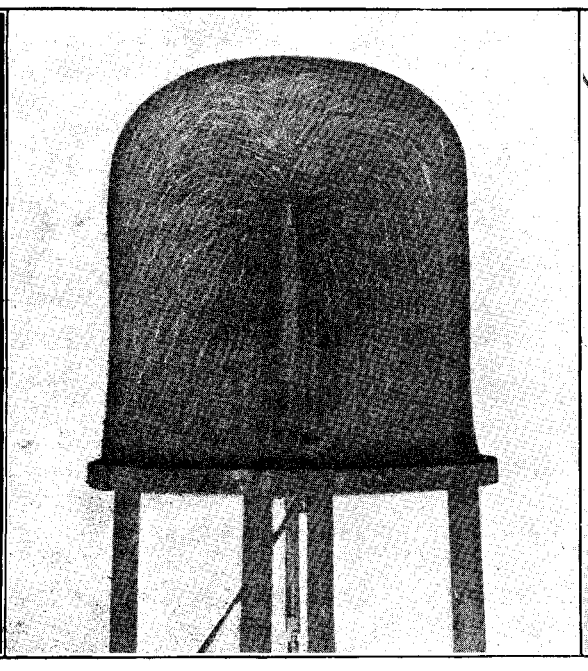


Fig. 2.—If the Supply of Electricity is Stopped the Flakes Fall; if it is Continued they are Rapidly Deposited on the Sides and Floor of the Jar.

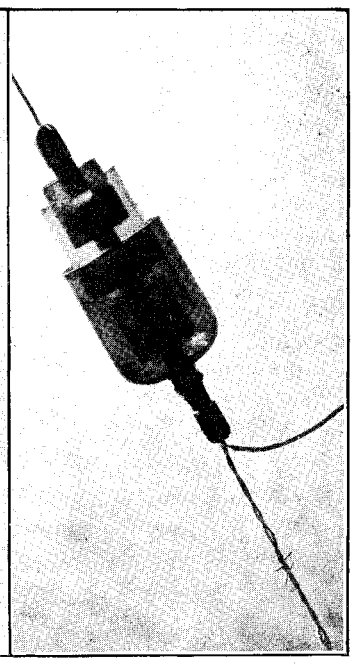


Fig. 7.—An Aerial Insulator that Fixes the End of an Insulated Barbed Discharging Wire, under Tension, by Means of a Wire Rope Tie.

to him during the early stages of the tests. It was considered possible that air in streaming over the surface of the solid immersed in the smoke, fog, or dust-laden atmosphere, might become electrified, and that from air so electrified dust might by some means or other be expelled.

To prove this hypothesis, the solid, which consisted of a rod, was electrified both positively and negatively to see what ensued. A current of 100 volts potential, increasing to 200 volts, was produced without scarcely noticeable effect. The positive electrification caused a slight widening, and the negative electrification a slight narrowing of the dust-free space. When, however, the potential was increased to a few thousand volts and brush discharge began to be possible, then a very violent and remarkable effect was noticeable. The dark space was widened enormously and tumultuously, and the whole box in which the experiment was carried out was rapidly cleared of smoke.

This experiment was carried out in the manner shown in our first illustration. A bell jar was filled with smoke—any kind will do, such as that produced from tobacco, camphor, turpentine, magnesia, brown paper, steam, wet straw, phosphoric acid, lead or zinc fumes—and the terminals of a Voss machine were connected respectively to the earth or its equivalent, and the second pole to an insulated point inside the bell jar. The Voss machine was then turned, and the small current produced caused the small particles of smoke or fog within the bell jar at once to form into flakes, which deposited themselves on the discharging rod and the sides of the jar, while the air within was rendered absolutely pure.

Exactly what occurs is to be followed in the second illustration, which shows the appearance of the jar during the discharge of electricity, being a temporary stage in the clearing. It was found impossible to obtain a photograph while the actual operation was in progress, owing to the short time occupied in the coalescing of the flakes—only a second or two. When the electric current is cut off, the flakes fall like snow; but when it is continued, they are quickly deposited. Whether positive or negative electricity is used, does not seem to make much difference.

But the dispersion of fogs, though easily accomplished in the limited scope of a laboratory experiment, yet this system offered no practical application under natural conditions in the open atmosphere. At that time the difficulties of producing a current of a sufficiently high potential, which would readily fly from the discharging points into the air, were such that further extension of the experiments had to be abandoned. In order to generate the requisite current required, a dynamo was imperative, but at that time, however, there was no type of direct continuous-current dynamo which could work at the essential high potential.

But the perfection of the dynamo enabled Dr. Lodge to continue his investigations, and some highly gratifying results were obtained. The inventor carried out a number of interesting and severe tests during some particularly dense fogs. The effect of the discharge of the current around the points of discharge was that the density of the fog was gradually reduced, and in a few minutes the air for some distance around was quite cleared, and the fog could be seen rolling toward this vortex, as it were, in fleecy clouds, which gradually melted away. This fact testified that the impulses were successfully dispelling the fog around the discharging points.

Prof. Lodge's experiments were shortly afterward, however, facilitated by the perfection of Mr. Cooper Hewitt's mercury-vapor rectifier. This device is especially useful, since it has the curious property of allowing the electric current to pass only in one direction through it. It can be also operated at very high potential, and enables alternating dynamos and transformers to be employed, the current being rectified so as to maintain a continuous discharge in one direction.

Following the introduction of this vapor lamp, Sir Oliver Lodge immediately applied it to his device. To comply with the special conditions and requirements of his operations, he devised a special type of rectifier upon this self-same principle, which is illustrated herewith. One way of using this rectifier is to employ it to redress the reverse pulses of an alternating current, thereby forming the positive and negative discharging streams. The special design of these rectifiers enables them to withstand abnormal pressure. During his present experiments, the inventor has been employing a battery of twelve rectifiers connected in series, and they will rectify at a pressure comparable to one million volts, which is the requisite potential. The dynamo current may be either a direct intermittent or an alternating one. It is first transformed up to the requisite potential, is then passed through the rectifiers, from where the positive and negative wires are taken to the discharging points. This battery of rectifiers will withstand excessively high potentials. They will not convey a current in one direction, though in the other direction they will transmit the current quite easily. If higher pressures are required, it is only necessary to increase the number of rectifiers.

To render this dispelling system most successful, it is imperative that the discharge should take place in the freest possible manner, without placing any unnecessary strains upon either the rectifiers or the insulation. This end may be assured by arranging the discharging wires in such a manner that one pole is earthed and the second erected on a mast or building or other high point, with a suitable means for discharging electricity, such as for instance a flame or a number of points. In some circumstances it is more convenient and satisfactory to employ two aerial wires, utilizing one for discharging the positive current, and the other for the negative streams, with a number of suitable points on each. For such cases Prof. Lodge has devised a special apparatus. Owing to the fact that there must be no leakage, the insulation must be as perfect as possible. The wires are incased in a thick envelope of gutta-percha, and every care is observed that there are no kinks, since the electricity might possibly spit from such points.

Owing to the tremendous potential of the current being transmitted through the wires, wherever the latter pass through any obstacles, such as for instance the wall of a building, the insulation has to be of the most elaborate nature to obviate any leakage of the current, since all surfaces near the wires are electrified to a certain extent. The result is that unless precautions are observed at these points, the current causes the small particles of moisture and smoke to adhere thereto, and in themselves constituting a gradually accumulating and excellent conducting surface for the electricity. For use at such points Sir Oliver Lodge has designed the insulator which we illustrate in the accompanying diagram. At the point where the wires pass through the obstacle there is a wooden frame with a vulcanite base. The insulator has a large glass rain guard, while the wire is carried through the wall in a glass tube inclosed in a gutta-percha-covered wire envelope, which is inserted in a vulcanite tube. The aerial tube insulator is somewhat similar, as will be seen in our illustration. This represents one of the aerial insulators employed to fix the end of an insulated barbed wire discharging under tension by means of a wire-rope tie. The electricity is brought in with a gutta-percha-covered wire. At the upper end of the wire there is a similar insulator supported from some elevated fixture, such as for instance a mast.

Sir Oliver Lodge has erected one of these fog-dispelling apparatus upon a small scale at the Birmingham University. The wires are carried from the inventor's laboratory within the building to high points upon the roofs. Although particularly dense fogs at this place are somewhat rare, yet Sir Oliver Lodge has carried out some interesting demonstrations, which have conclusively shown the utility and capabilities of the invention.

The system is not only applicable and valuable for the dispersion of atmospheric fogs, but is of great commercial utility. There are many industries where the atmosphere within the manufactories is constantly laden with fine dust or fumes, such as in flour mills, lead, copper, and arsenic works. In some instances these fumes are highly explosive, in others poisonous, and in many cases valuable, and are wasted, owing to there being no means of arresting their escape. Sir Oliver Lodge has devised an arrangement by which these fumes may be condensed by means of this device, placed in the flues or a settling chamber. The same device when applied to chimneys also constitutes an admirable method of abolishing smoke from chimneys, the particles of carbon being arrested during their passage up the chimney and deposited, so that nothing escapes into the outer air but the waste heat.

At Liverpool the inventor practically demonstrated its efficacy for the dispersion of river fogs. The apparatus was erected on one of the banks of the Mersey, and although the potential of the current employed was not abnormally high, yet a clear space of about 180 feet in radius around the discharging points was completely cleared of fog, the moisture of which it was formed being deposited. For the dispersion of such natural river fogs, the inventor suggests the suspension of barbed wires on either bank parallel to the river, and carried at a sufficient height from the ground as not to affect the traffic below. Positive electricity would be discharged from the wire points on one bank, and negative current from the corresponding wire points on the opposite bank. In this manner the waterway could be maintained absolutely clear to a sufficient height for the shipping.

In the quarterly statement issued by the committee of the Palestine Exploration Fund brief mention is made of a report received from Dr. Gurney Masterman on the changes of level in the Dead Sea during the second half of the year. It is stated that a continual fall has been observed. The level taken on October 26 was 10 inches lower than in August and 23½ inches lower than in April, 1904, the lowest level of 1904 being 15½ inches lower than the lowest of 1903.

Correspondence.

Tidal Power on Rivers of Bay of Fundy.

To the Editor of the Scientific American:

Recently an article appeared in your valuable journal from a Mr. Cleaveland, relative to the great opportunity for getting power from the tidal rivers at head of Bay of Fundy, notably the Petitcodiac River, flowing past Moncton, New Brunswick.

Mr. Cleaveland's contention is good so far as it goes, and undoubtedly much power could be had, at certain times, but he forgot to mention that for five months of the year, practically, these rivers are one solid mass of snow and ice, hence there would be only seven months of the year the power could be utilized properly.

It may be, however, Mr. Cleaveland has some plan or theory, whereby this tidal power could be still used during the five winter months. If so, I am sure all your readers and the public generally would be pleased to know his views on same, as if this difficulty could be met, there undoubtedly could be a wonderful amount of power derived from the many large tidal rivers at the head of the Bay of Fundy, such as the Petitcodiac, Tantramar, Shubenacadie, Avon, St. Croix, and many others of smaller size. I should like to hear more upon the subject. Inquirer.

New Brunswick, January 23, 1905.

The Automatic Train Stop.

To the Editor of the Scientific American:

Your admirable editorial entitled "Schedule vs. Safety" has been called to my attention. As I am the inventor of the automatic train stop used on the Interborough tunnel to which you refer, I feel entitled to express my opinion of the manner in which you have handled the subject. The eminently successful action of the device on the express tracks in the tunnel certainly warrants the belief that it could be made to work equally as well on the local tracks, were it not for the impression now prevailing that it is necessary to keep each train in a separate section or block. Theoretically this is right, and is just what it does. In practice, the presence of a train in one section need not require that a train about to enter a section behind it should come to a full stop, and stay there until the first mentioned train has proceeded into the next block; for that would most certainly congest a very busy line.

The proper function of the automatic train control is not to assume the prerogatives of the healthy human intelligence, but it is rather the substitution of mechanical precision for the occasional lapses or misconceptions of the human element, thereby preventing an impending catastrophe until the man at the controller can intelligently and comprehensively reassert his control and proceed under (if you please) the united judgment of himself and the train conductor, who might otherwise ordinarily remain in ignorance of the existence of the danger conditions confronting his train.

At least one chief engineer of signals says, in effect, that "an excessive amount of traffic justifies the taking of increased risks in order to get the company's business over the road on time." The public, however, are beginning to think that increased business calls for extraordinary precaution; in fact, records show that the most and the worst railroad wrecks have occurred in years and on those roads put down as the busiest and most prosperous. On a road operating but two or three trains a day, it is much safer to depend upon the judgment of the engineer than it is upon roads where trains are counted by the hundreds. The latter should be required by law to use only the absolute system, which means a full stop at a danger signal.

The statement of the signal engineer above referred to shows that permissive signaling is the rule on his road rather than the exception. The difference between the application of the absolute system with visual signals and the same system with visual signals and the automatic control as an auxiliary is the same, except when a misunderstanding of the visual or written orders is offset by the mechanical precision of the automatic control, which never sleeps nor becomes confused. He who says it is impractical, is practically claiming that human ingenuity has reached its fullest limits in the present perfection of visual and audible signals, which in turn means that as traffic and speed increase, we are to be treated to increasing numbers of casualties. Where trains are run under close headway, my resetting device is essential, and may or may not be so operated as to require the intelligent action of two individuals to restore normal power and brake system conditions. The time for its operation can be reduced to two or three seconds, where the rules of a road permit a train to go on "under control." This would be of slight consequence compared to the risk run by not using an automatic control. T. E. Kinsman.

91 Liberty Street, New York.

TREES AS ANTENNÆ IN WIRELESS TELEGRAPHY.

BY A. FREDERICK COLLINS.

The antennæ utilized in picking up waves emitted by a distant wireless telegraph radiator have been the subject of much investigation since the early experiments of Popoff and Marconi, and as a result the laws relating to the forces set up in a vertical receiving wire by electric waves, the fronts of which impinge upon it, are now fairly well understood.

The junction of the earthed terminal of the radiating and receiving aerial wires are not, however, as amenable to mathematical formulæ, but actual practice has shown that assuming any one of the several theories to be correct, a good ground is very essential in the elimination of obstacles that produce interference.

Some exceedingly vital experiments have recently been conducted along these lines by George O. Squire, Ph.D., Major Signal Corps, U. S. A., who has carefully observed and noted the absorption of electromagnetic waves by living vegetable organisms; and in these tests some valuable data is adduced, which shows that trees may be made to serve the useful purpose of an impromptu but good ground in field operations.

In the preliminary statement made by Dr. Squire, it is pointed out that the value of a good earth in wireless telegraphy cannot be overestimated; and he cites the fact that Fessenden and Stone have patented devices enabling ideal conditions to be more nearly satisfied. In the specifications of the former's patent there is embodied the following observations, namely, that he (Fessenden) has found it essential for the proper sending and reception of these waves that the surface over which they travel should be highly conducting, more especially in the neighborhood of the point where the waves are generated.

Fessenden ascertained, moreover, that this highly-conducting portion of the surface of the earth should extend to at least a distance from the origin of the waves to one-fourth of the length of the waves in air, and in the direction toward the station to which it is desired to send the waves. In order to accomplish this, a wire is connected to one side of the spark gap, and this is led over buildings, trees, and other intervening objects beyond the limits of obstruction when the wire is earthed. The inventor terms this arrangement a "wave chute."

John Stone Stone advocates a little different method to increase the effective radiation of the electromagnetic waves, and this, he explains, consists in artificially increasing the natural conductivity of the earth or other media in the immediate vicinity of the base of the transmitting aerial wire, and maintaining said surface in a constantly-connecting state. To bring about this result, it is only necessary to lay a wire netting having a large mesh on the surface of the ground, so that it completely surrounds the aerial wire with which it is connected; and the designer states that the netting should have a radius at least equal to one-quarter of a wave length.

In neither the patents of Fessenden nor Stone is there any mention of the application of the above schemes to the receiving aerial or antenna, or that these arrangements would facilitate the reception of electric waves; but the point that both these specialists make is the desirability of providing artificial earths for the radiating aerials. From Major Squire's researches it at once becomes evident that a good ground is just as important at the receiving end as at the transmitting station; again, it is pointed out that the necessity to insulate thoroughly the earthed terminal of the spark gap or wave detector, as the case may be, from the vertical aerial wire, so that there may be no leakage of the high-frequency oscillations set up, must not be ignored.

Under the conditions imposed in temporary field operations, as in military maneuvers, it is not always feasible, especially in dry countries, to obtain a good ground, i. e., a constantly moist earth; and these facts as observed above, together with the difficulties just cited, led Major Squire to consider the possibility of resorting to the use of growing trees or other vegetation as a quick and ready solution for the problem.

The data upon which these deductions were based, and which afterward resulted so successfully when the experiments were made, began with an early observation of Alexander Graham Bell, who in 1877 carried on with Frederick A. Gower, in London, a remarkable series of tests with the former's newly-discovered telephone. The inventor and his friend took a couple of telephones and an insulated wire about 100 feet in length into a garden, and were enabled to carry on conversation with the greatest ease when they held in their hands what should have been the earth wire, so that the connection with the ground was formed at either end through their bodies, their feet being clothed with cotton socks and leather boots.

The day was fine, and the grass upon which they stood was seemingly perfectly dry. Mr. Gower made earth connection at his end of the line by standing upon a grass plot, while at the other end of the line Mr. Bell stood upon a board; and when the former sang into the telephone, to the latter it was distinctly audible. Upon examining his feet, Mr. Bell found that a single blade of grass was bent over the edge of the board, and that his foot touched it.

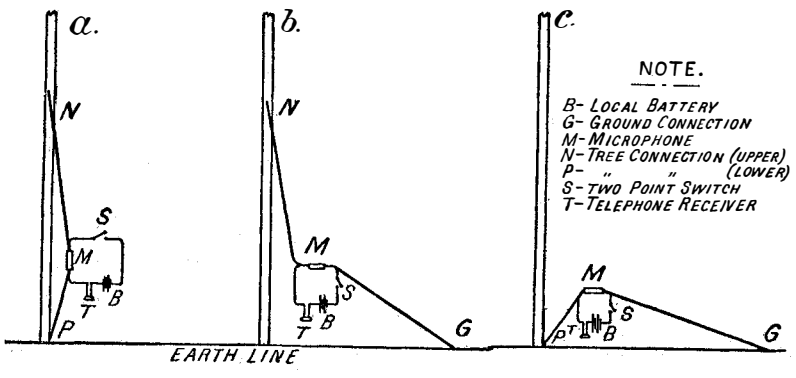
The practical application of this pretty little experiment was made by Lieut. William M. Goodall, of the United States Signal Corps, who found that he could obtain a much better ground, when laying rapid telephone lines in a wooded country, by merely driving an iron nail into the trunk of a tree or shrub than by the ordinary and more laborious method of burying a conducting plate of metal in the earth itself.

This singular fact was afterward communicated to Major Squire by General Arthur McArthur; and later, when the military maneuvers of the Department of California at Camp Atascadero, Cal., were held last August, the doctor was enabled to try out the efficiency of this simple method of grounding wireless telegraph aerials in places where it would have been impossible to have grounded the circuit in the ordinary way.

In these tests it was found that the conductivity of a growing tree in a healthy condition for circuits used in telephony with wires was sufficiently good, so that a nail driven in the tree at a height of thirty feet served the purpose nearly as well as though driven in at the root. Not only this; but it was also demonstrated that articulate speech could be transmitted and received from one tree top to another when the trunks of both trees were employed to complete the circuit.

The utilization of growing trees as antennæ for the reception of wireless telegraph messages logically followed the experiments taking place at Fort Mason, San Francisco, Cal., where the U. S. Signal Corps has a wireless telegraph signaling station, and at Alcatraz Island, in San Francisco Bay, a distance of about one and one-half miles, where a second wireless telegraph station is located.

Preliminary trials, however, were made by erecting a temporary receiving station about one thousand feet



PRINCIPLE OF MAJOR SQUIRE'S SYSTEM.

from the regulation transmitting station at Fort Mason. It was thought best to ascertain what effects, if any, the impinging waves would have at short range before longer ones were attempted. The transmitting apparatus at the regular station consisted of a small induction coil having a maximum spark length of four inches and a radiator system having its aerial wire suspended from a 75-foot mast, which was located on a bluff about 80 feet above the sea level. The receiver included an auto-coherer, made by filling a pocket, formed between two conductor plugs sliding in a small ebonite tube, with carbon granules such as are used in telephone transmitters.

To this microphone detector there were connected in series three dry cells and a pair of head telephone receivers. The method of connecting the local battery circuit with the external or oscillator circuit is shown in the diagram, as well as the different connections used in elevating and earthing the receiving wires. The first test made by Major Squire is indicated graphically at *a*. Now, instead of grounding the earth wire, as is usual in wireless telegraph practice, a nail was driven in the tree a couple of inches above the earth line, at the point marked *P*, the electrical contact being only made with the tree itself.

The terminal, *P*, remained stationary, but the wire *N*, serving as the opposite terminal, was moved up and down the tree; while these tests were in progress, the transmitter was sending out waves approximately 300 feet in length; when the terminals, *P* and *N*, were separated three or four feet, the signal letter could be feebly heard, the volume of sound increasing as the distance between *P* and *N* increased, until *N* reached a point where the first branches of the tree began to diverge. That electrical oscillations were set up in the tree itself, and not in the wire, was proven conclusively by using a lead-covered insulated wire leading from the detector to *N* and *P* (see *a* and *b*), this providing an effective barrier to the electric waves, since they could not by any possible means set up oscillations in the inner wire. To further demonstrate the efficacy of the tree as an antenna, screens of wire netting having a fine mesh were used; and not only was the receiver entirely covered, but the wire *N* as well; this protection, however, did not in any way alter the nature of the indicators.

Dr. Slaby has shown that a vertical wire earthed at its lower extremity, if it is one-fourth the length of the received wave, has its potential node and current wave crest at a point where the wire makes contact with the earth; and hence Major Squire regarded a growing tree as a cylindrical antenna, and so earthed one terminal of his detector at the root of the tree, which would, in accordance with the above theory, have its potential node at or near the intersection of the earth line.

The arrangement adopted then took on the form shown at *c*, the opposite terminal being connected to the ground at *G*, at a distance from *P* approximating one-fourth the length of the wave to be received. This method of connecting in the receiving device is at once the simplest in the art, and must prove of great value in the operation of portable wireless telegraph systems.

The Mediterranean Cup for Motor Launches.

The motor boat race from Algiers to Toulon across the Mediterranean will be one of the leading events of the year. The race is organized by the Matin, one of the principal journals of Paris, and is known as the Mediterranean Cup. It is a challenge cup, like the Gordon Bennett for motor cars, and will remain in the hands of the winner until he is beaten. M. Charley, one of the leading spirits in automobile and sporting affairs and representative of the Mercedes Company at Paris, endowed the Cup with the sum of $2,000, so as to engage the competitors to undergo the expense which is necessary for the event. The design of the Cup is to be given to the successful artist after a concourse which is to be held shortly. The number of entries for the race is now sufficient to assure its success. Among these may be mentioned the "Mercedes" racer 60 feet long, equipped with a 200-horse-power motor, belonging to M. Mercedes-Jellineck, and a second "Mercedes C. P." of 100-horse-power and 50 feet length, owned by M. Charley. These two boats are now in construction at Paris. M. Perignon is building a new racer of high power, which will have a De Dietrich motor. The latter is constructed by the well-known automobile firm. Mr. S. F. Edge will enter the race with the boat which he is now having built at Yarrow. Messrs. Dutheil, Chalmers & Co. have two cruisers under way for the Algiers-Toulon race. They are now trying three motors which will use heavy kerosene oil. Two of the motors will be placed on the same boat, and each motor will drive a separate screw. The Duke of Decazes is having a new launch built at Cannes. It will be known as the "Quand-Méme," and is a rapid cruiser of 75-foot length, carrying a Baudoin motor. Doranlo & Co., of Geneva, will enter the "Albatros," which measures 50 feet long with a 16-inch draft. Among others may be mentioned M. P. Courtot, the Ostend (Belgium) constructor with the "Cosmos," carrying a 200-horse-power motor, and Marcel Hamand with the torpedo launch "Patrie," measuring 78 feet. It is now building at Nantes.

The Largest Diamond in the World.

News comes from Johannesburg that the largest diamond ever found has been taken out of the Premier mine. It weighs 3,032 carats in the rough. A few years ago a large black diamond was found in Brazil, which was somewhat larger. This gem was of no ornamental use, however, and was eventually cut up and used in making diamond drills. Except for this, the gem just found is three times larger than any hitherto discovered. The stone weighs about a pound and a half. In cutting it from forty per cent to sixty per cent will be lost. The stone's value will depend, of course, upon its quality and shape.

Approximately, the new stone weighs about 621.56 grammes, or about a pound and a half avoirdupois. The last diamond of any note found in recent years was the "Syndicate," dug up in the De Beers mines. It weighed, uncut, 960 carats.

Here is a list of a few famous diamonds:

	Carats (rough)	Carats (cut)	Diameter	Discovered	Purchaser	Value
New Gem	3,032	....	4 inch	1905	.. ..	$4,000,000
Syndicate	960	....	....	1900	Tiffany.. ..	.....
Kohinoor	790	102	....	1804	Queen Victoria	600,000
Sanay	....	53	....	1477	Charles the Bold.	70,000
Hope	112	44	1 inch	1668	Louis XIV	350,000
Brazil	900	130	3 inch	1680	Court of Portugal	2,000,000
Star of the South	254	83	....	1858	Paris	450,000
Nizan of Hyderabad	431	279	....	1760	Paris ..	1,500,000
Orloff	....	194	...	1776	Catherine II.	.....
Moon of Mountains	....	....	....	1779	Russia	50,000
Pitt	....	136	....	17—	Louvre	.....
Victoria	....	180	.. .	1740	Nizan	.....
Ernestine	221	110	....	1900	America ..	40,000

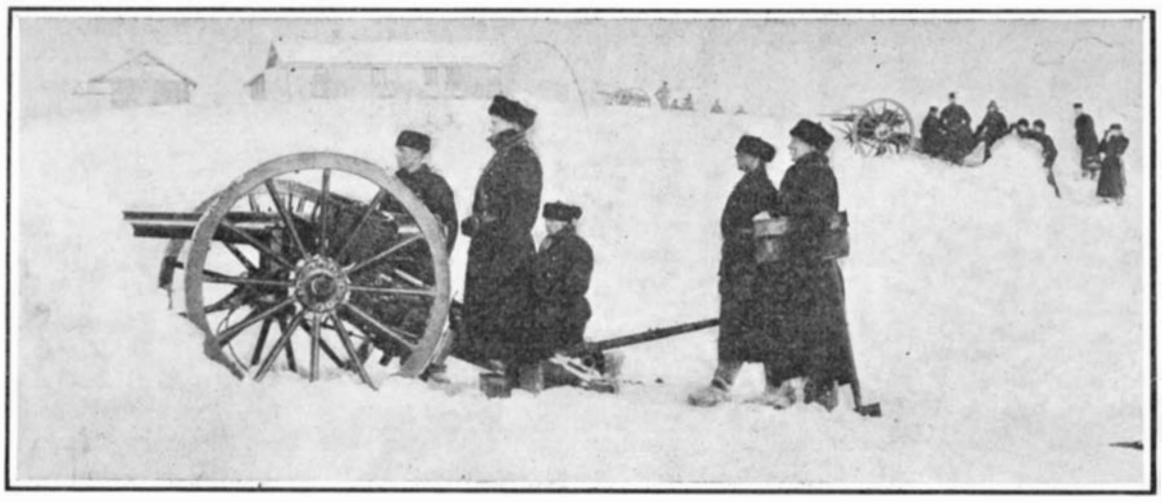
THE SKI IN PEACE AND WAR.

As the days in the summer are long and bright in the land of the Vikings, so they are dark and short in the winter, and the winter is long and dreary, especially to people reared under a more southern latitude. As a beaming light in all these gloomy seasons stands the Norwegian sport, which may be divided into four groups: skiing, skating, coasting, and sleighing.

Skiing is the national sport of Norway, and by its prestige, the one most devotedly pursued. The ski has been used here for centuries, if not as a sporting implement, then as a necessary means of locomotion from one part of the mountainous country to another, where snows lie deep and highways lie buried or are unknown; and while the ski to this very day in several districts serves a practical purpose, it is mainly its connection with the sport that has made it known as the "human wings." As there may be a great many who do not know what a ski is, it may be stated that the ski consists of a narrow plank of wood, rounded and curved upward at the toe, furnished with straps or thongs in the center, or somewhat behind the center, for fastenings to the foot. The popularity of the ski sport is increasing with every season.

As example of the popularity of the ski sport may be mentioned that the Princes Gustav and Vilhelm have a ski hut in the Jothunheimen (the loftiest mountain regions of Norway) which they visit every year for several weeks. The two princes took part lately in a ski leaping competition in Sweden, and shared glory and defeat with the boy from the farm and factory.

To get a clear conception of what this sport really is, the ski must be tried. "Holmenkol" day is to Norway what the Derby day is to England. The twenty-five to thirty thousand spectators form from the early morning a continuous stream of humanity from Christiania up to the heights of Holmenkollen, a distance of about four miles. Various means of locomotion are utilized on the occasion, such as ski, electric railway, sleighs with ordinary horses and the horses of the apostles. The leaping contest generally starts at one o'clock and lasts about three hours. This year the number of competitors was 244, whereof 26 had previously taken prizes in the Holmenkol races. The slope itself is 186 yards in length, and rises to a height of nearly 160 feet above the plain (lake), while the platform of snow, or "hop," from which the leap is made, is situated about two-thirds of the way down. Notwithstanding its apparent steepness, the angle of the upper portion, that above the "hop" or ledge from which the men bound, is only about 15 degrees, the lower part 24 degrees, but the descent on ski only occupies from seven to nine seconds, of which two to three seconds may be in the air during the leap. Presently the sound of a bugle is heard, and a dark speck is seen descending toward the center of the declivity, where the ledge or platform whence the leap is made is built. Then, like a ball rebounding from the ground, there arises, and stretches into the semblance of a man, a figure which, making a curve in the air, alights on the slant beneath, shoots downward on the level with lightning speed, and finally pulls up by a rapid and graceful turn, facing the hill he has so speedily descended.



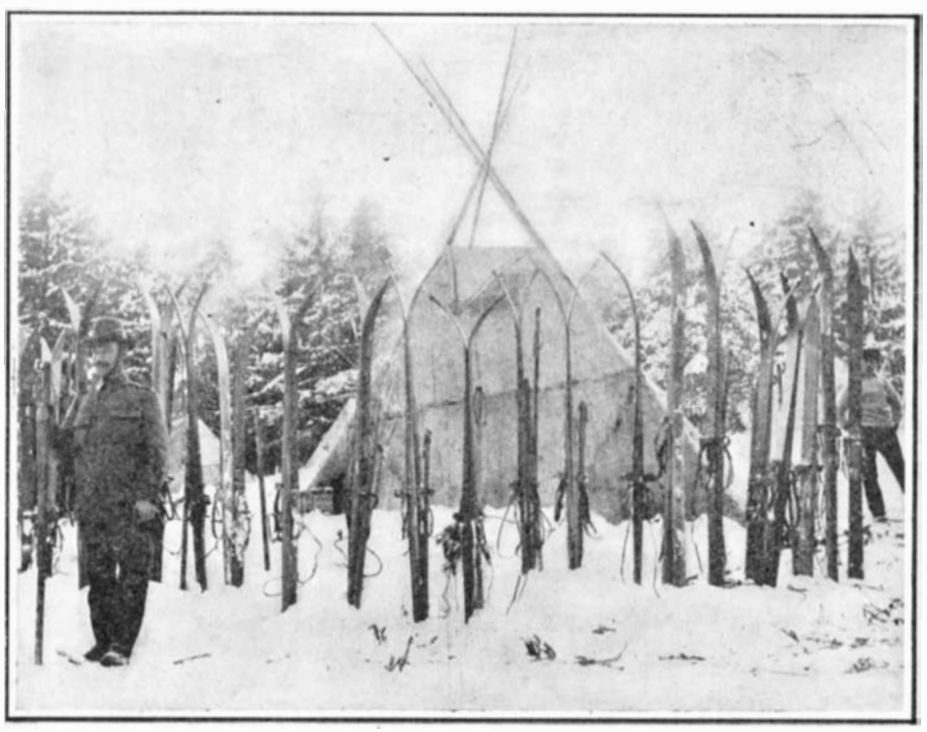
Winter Training of the Artillery.

Words cannot adequately describe the features of such a contest, or the sensations of an observer when he sees the men swooping through the air, and effectually performing a feat which seems impossible of accomplishment. It must be seen in order to be understood, and even then, the stranger who views it for the first time leaves the spot filled with appreciation of the daring exhibited by the Norwegian youths, but still more or less bewildered by the spectacle. Not long ago a ski runner jumped over a carriage which came in his road.

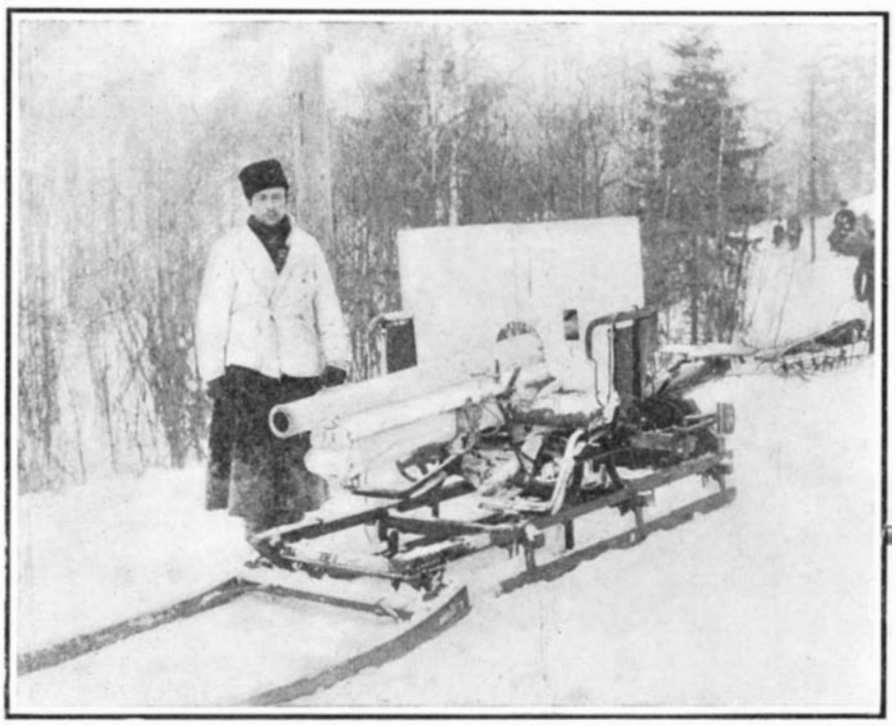
The art of skiing is part of the military training in Norway. The army has a ski corps as well as a bicycle corps.

The Ski Corps Leaving the Barracks.

Winter Camp of the Ski Corps.

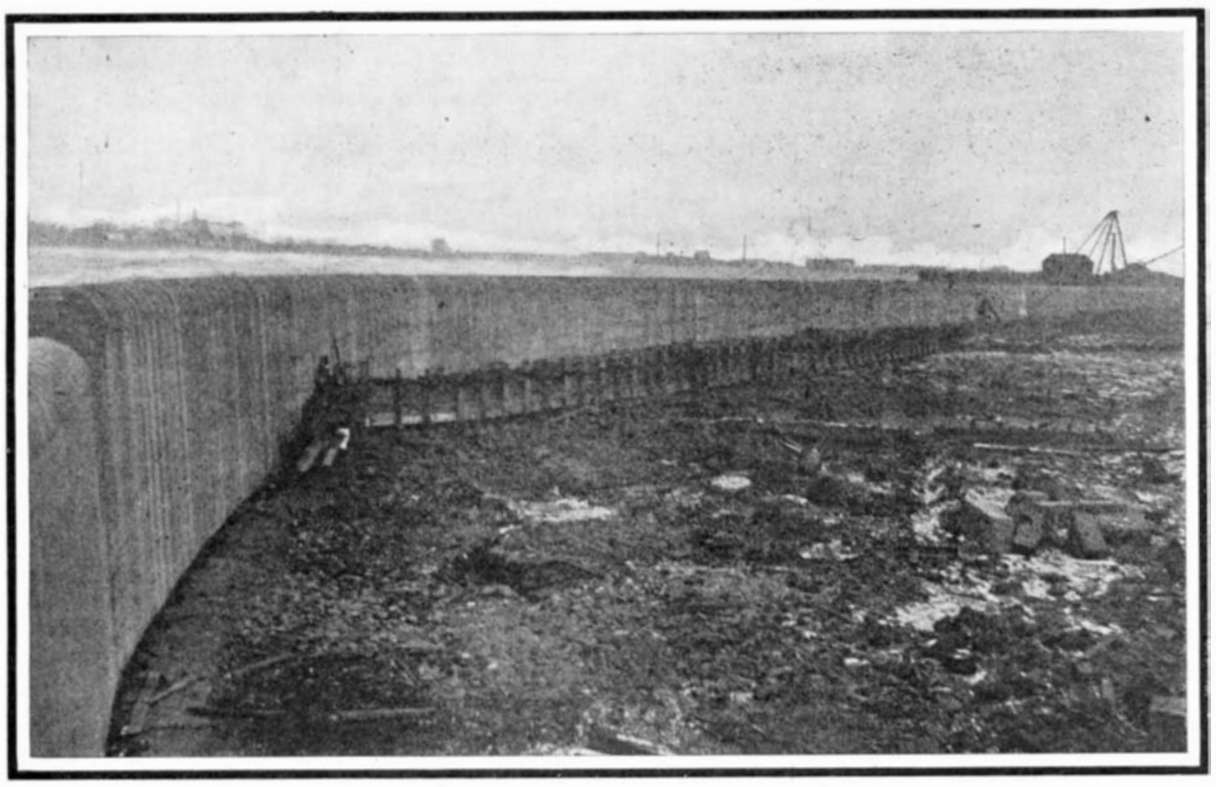


Skis Stacked Outside of Tents.



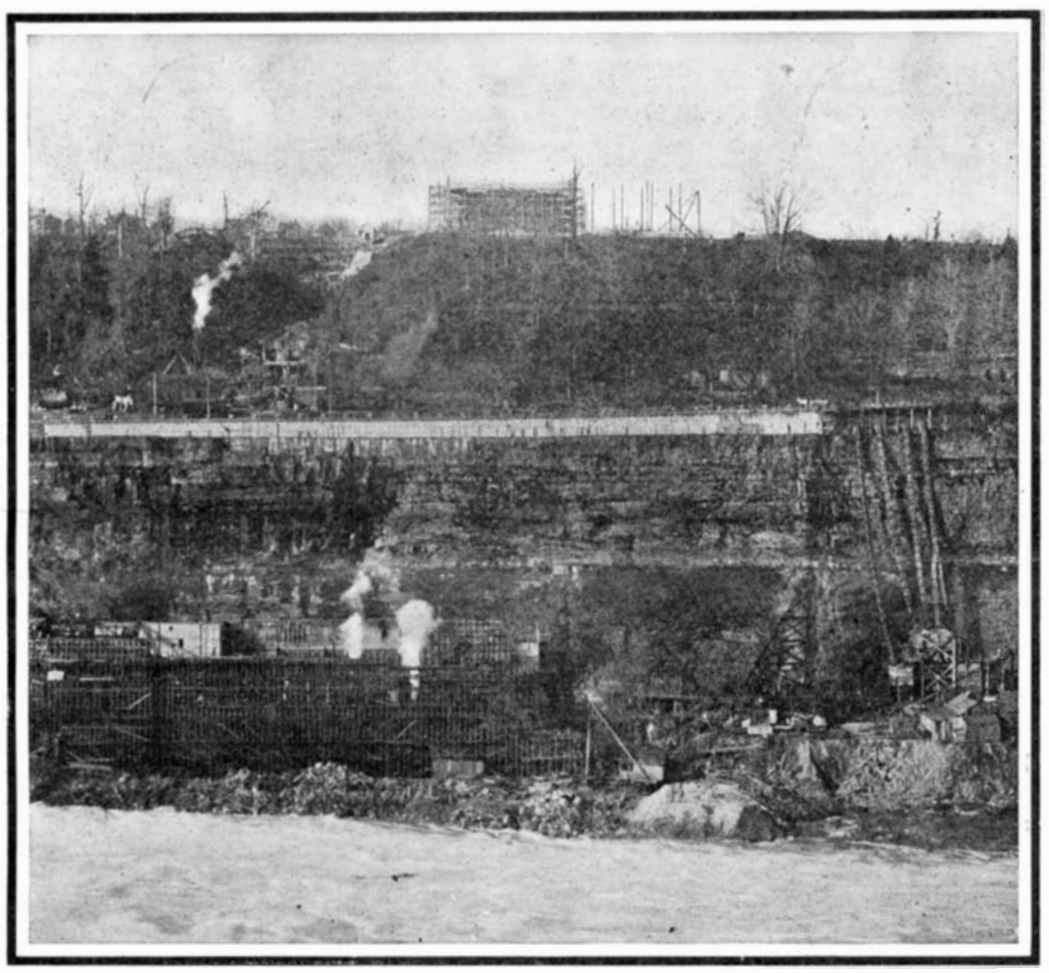
A Machine Gun and Its Sled Carriage.

THE SKI CORPS OF THE NORWEGIAN ARMY.

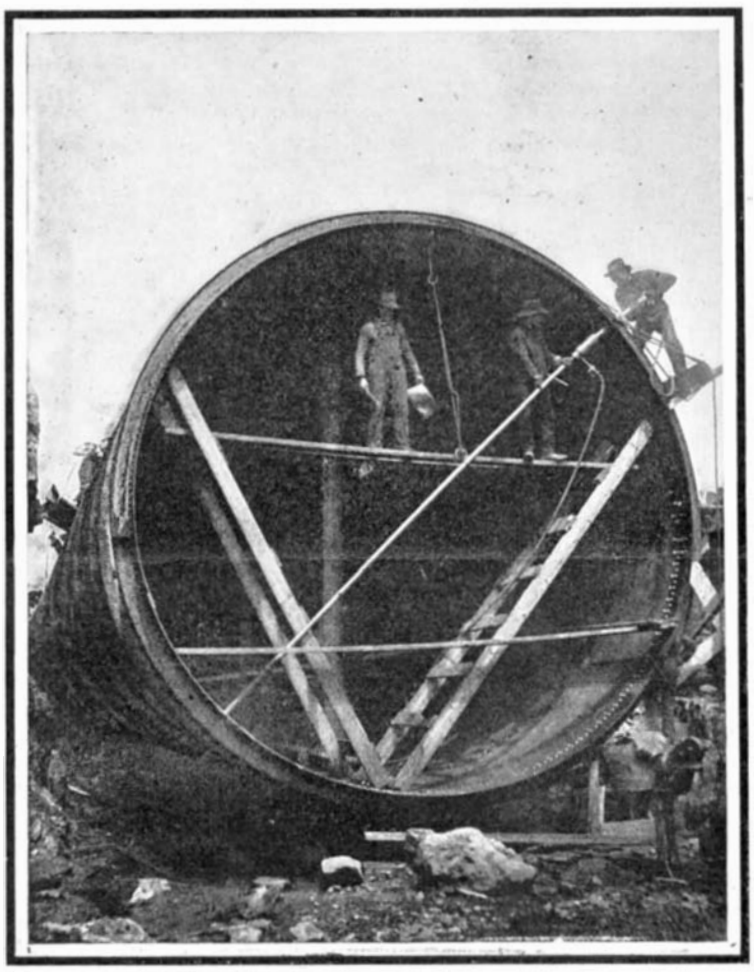


The Great Concrete Wall for Diverting Water of the Upper River.

Site of Power House, Seen From Canadian Side.

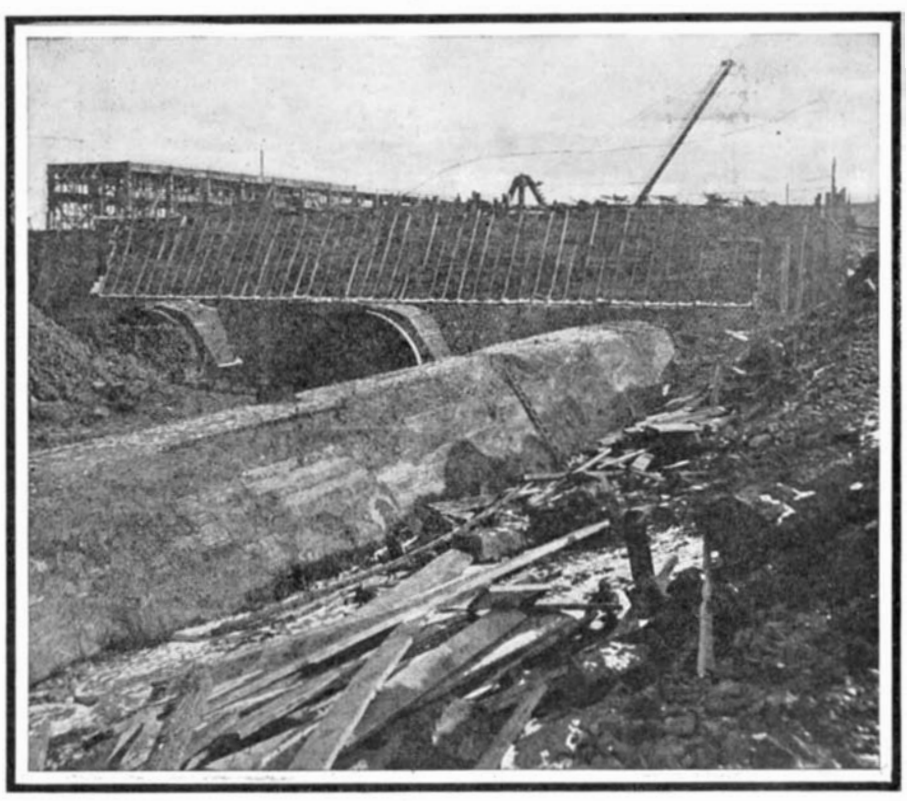


Ontario Power Company's Power House at Water's Edge Below the Falls.



Riveting Re-enforcing Rings on a Flume Section.

Laying One of the 18-foot Steel Flumes. These Will Everywhere be Buried From Sight.



Intake of the 18-foot Flumes at Gate House, Showing Method of Concrete Protection.

CONSTRUCTION OF THE ONTARIO POWER COMPANY'S 180,000-HORSE-POWER PLANT AT NIAGARA.—[See next page.]

It is, however, only officers and petty officers who receive training on ski, for the reason that the Norwegian soldiers are drilled only in summer. This fact, however, would be no serious drawback in case of actual duty in the field in winter, because the Norwegian army includes several companies, where every man that ever wore the king's uniform has from childhood known how to handle a pair of ski to the best advantage. For the last two or three weeks all the cadets and all the pupils of the petty officers' schools have been going through extensive drills out in the country. Some of them have slept twenty-four nights in succession in tents on the snow-covered field.

It may be that military ski training would not be of much practical value to some other countries, but it is certain that in a country like Norway it would be absolutely essential for the movement of troops in many parts of the country in winter time.

ONTARIO POWER COMPANY'S POWER PLANT AT NIAGARA FALLS.—II.

There are three power projects under way in Queen Victoria Park on the Canadian side of the river at Niagara Falls, the combined output capacity of which is to be 415,000 electrical horse-power. Of this stupendous amount of electrical energy, the Ontario Power Company proposes to develop 180,000 horse-power, which is the largest amount yet contemplated for any single installation at Niagara Falls. It is within 25,000 horse-power of the total output of the two great power houses of the Niagara Falls Power Company on the New York side at Niagara.

In the development of the Ontario Power Company there are features quite new in the Niagara region, and none of the work done in developing power there has been more interesting than that of this company. The Ontario Power Company was second to select its site and method of development on the Canadian side, and its plan at the start called for the diversion of the waters about Dufferin Islands in order that the forebays might be constructed at the point selected. To accomplish this, huge wing dams were constructed, and when completed a vast area of the river bed was unwatered.

This company's plan called for the construction of an outer and an inner forebay above the Dufferin Islands, the point being about a mile above old Table Rock. From the inner forebay it is planned to run three steel flumes to Table Rock, where the water of the flumes will empty into an open relief or spillway, from which it will be carried through penstocks to the turbines located in the power station at the water's edge in the gorge, very close to the foot of the Horseshoe Fall.

To develop the 180,000 horse-power contemplated, the Ontario Power Company will divert about 12,000 cubic feet of water every second from the river above the Horseshoe or Canadian Fall. This diversion will be made at a point where the upper rapids begin. In passing from the main stream to the outer forebay, the diverted water will meet an ice fender or curtain, which is expected to prevent much of the ice that flows down the upper Niagara from Lake Erie in winter time entering the forebay. The ice curtain will drop to within a few feet of the river bed, and it is expected that the powerful currents of the locality will sweep the ice from the face of the curtain. The depth of water at the intake will be about 13 feet. The area of the outer forebay is about eight acres, while that of the inner forebay is about two acres, making ten acres in both forebays, all of which covers the normal river bed, a considerable amount of which was blasted away in order that a sufficient depth of water might be obtained. In the construction of the forebays, piers and various foundations, a vast amount of concrete work was done.

At times of high water the river wall of the outer forebay will act as a spillway. At the lower end of the outer forebay the walls are connected by a screen house 320 feet long, while at the lower end of the inner forebay the gatehouse is located, and is 120 feet in length. The water will be about 20 feet deep at the screenhouse and 30 feet deep at the gatehouse. Should any ice or debris reach the gatehouse section of the inner forebay, it will be discharged through an ice run five feet wide.

The three steel flumes will tap the water supply at the gatehouse, the flow being regulated by steel gates. One of the flumes has already been laid. It is made of ½-inch steel plates, and has an inside diameter of 18 feet. Every 4 feet the plates are strengthened by 8-inch steel deck beams riveted to the upper section. In order that the presence of the big steel pipe might not mar the scenic features of the park, the commissioners of Victoria Park directed that it be laid in a trench excavated for its entire length of over 6,000 feet. Previous to being covered by earth a conductor was placed to carry off any electric currents that might cause electrolysis, and the upper surface of the flume was sheeted with concrete in order that any unequal earth pressure might be reduced.

Each 18-foot penstock is expected to supply about 4,000 cubic feet of water per second, and this water will be caught up in eight penstocks and carried to the station, making 24 penstocks in all that will pass from the top of the bank through tunnels excavated through the high bank, in order that they may not be in view of sightseers on either side of the river, to the power house. Six of the penstocks connecting with each flume will be nine feet in diameter, while two others will each have a diameter of 30 inches. The large penstocks will supply the turbines of the generator sets, and the small penstocks will supply the wheels of the exciters. At the power house the nine-foot penstocks branch out so as to supply water to the twin turbines that will be used. These turbines will make about 187 revolutions per minute, and will be direct connected to generators of 10,000-horse-power capacity. Tail races under the power house carry the discharge water from the turbines to the lower river.

The generators will deliver three-phase current of 25 cycles and 12,000 volts. They will be controlled by apparatus installed in a transforming and distributing station located on the bluff back of Victoria Park 255 feet above the power station and over 500 feet back from it. It is provided in the agreement made with the park commissioners that all the power must be used outside of the park limits, but if there is demand for it, one-half of the product of the station must be delivered to Canadian consumers. The Ontario Power Company has made a contract with the Niagara, Lockport and Ontario Power Company whereby it is to deliver 30,000 electrical horse-power at the international boundary line at or near the Niagara whirlpool by July 1, 1905, and an additional 30,000 electrical horse-power at the same point by January 1, 1907. This contract extends to April 1, 1950, and may be extended sixty years longer, or to 2010. On its part, the Niagara, Lockport and Ontario Power Company is to erect a transformer station on the American side of the river, and it is to construct a transmission line as far east as Rochester, N. Y., by July 1, 1905. From this, one is led to believe that a portion of the product of the Ontario Power Company will be transmitted to Lockport, Medina, Albion and other places in western New York.

For its rights in Victoria Park, the Ontario Power Company pays an annual rental of $30,000 a year, and in addition will pay at the rate of $1 per horse-power for all power sold above 20,000, up to 30,000 horse-power; 75 cents per horse-power for all above 30,000, up to 40,000, and 50 cents per horse-power for all sold or disposed of above 40,000 horse-power.

The engineers of the Ontario Power Company are Messrs. P. N. Nunn and L. L. Nunn, while the resident manager is Mr. Banker R. Paine.

The New Chinese Trade-Mark Law.

The increase of business of our Western merchants with the Far East, and the difficulties experienced in protecting trade-mark rights, familiar enough in the Occident, but little known in the Orient, have led to the enactment of new trade-mark laws in Asiatic countries. The old laws, while satisfactory under the old conditions, were not suitable under Western changed business methods. When there are few middlemen, and most of the business done is an exchange between manufacturer and consumer, the value of a trade mark is not apparent; for the consumer knows whose goods he is purchasing, and if the manufacturer has a reputation for the quality or quantity of merchandise sold for a fixed price, the consumer may go again to the man whose goods he previously found to be satisfactory. Where, however, the goods are sold in quantities to middlemen or storekeepers, the consumer is unable to determine whose goods he is purchasing when there are no labels or trade marks on the wrappers. With the extensive use of trade marks without changes in the laws to protect this new species of property, there was considerable opportunity for fraud. For some time, it has been customary for Western merchants to protect their trade marks in China by registering them in the consulates of the home countries, the consuls of the different countries recognizing the property rights of the registrants, and enforcing them against infringers who were citizens of their respective countries, and the China Foreign Office enforcing rights when the infringer happened to be a Chinese. The many offices at which registration could be secured, and the unsettled procedure which was followed in proceeding against infringers, led to the passage of the new Chinese law, under which the trade marks of all merchants doing business with China should be registered. The new law provides for the grant of registration to the first person filing an application, the only exceptions being in cases where the applicant has protected his mark under the old procedure, by securing a registration at a consulate, and where registration has been secured in the home country of the applicant. To secure the benefit of these exceptions, the applicant should file his Chinese application within six months of October 23, 1904. When the home registration is secured after October 23, 1904, the proprietor of the mark has four months in which to file his Chinese application with the priority of the date of the home registration. As the time in which merchants may file their application in China with the priority of October 23, 1904, will shortly expire, many applications are being filed. When the applicant is unable to take advantage of the provisions which enable him to claim the date of the passage of the new law or the date of his home registration as his date of priority in China, his application is dated as of the day on which it is filed.

Ample provisions are made for the enforcement of the rights granted by the new registrations.

The Current Supplement.

Dr. Alfred Gradenwitz opens the current Supplement, No. 1519, with an illustrated article on a gigantic electric crane, which has a maximum lifting power of 225 long tons. Mr. R. C. Carpenter writes on some recent experiments with materials which retard the activity of Portland cement. "Leather from Seal Skins" is the subject taken by Mr. Charles H. Stevenson for discussion. The optician will read with interest an article on the raw materials used in silvering. Napier has designed a launch for the British Admiralty, capable of carrying six officers in full dress out to a vessel anchored in any weather, even half a gale of wind, at a considerable speed, without being inconvenienced by spray or water. A portable oil engine with a reversing gear is described and illustrated. The plant is capable of moving over heavy and difficult country where roads are practically non-existent. An article of speculative interest is that entitled "The Molecule, the Atom, and the New Theory of Matter." A list of prizes proposed by the Paris Academy of Sciences for 1905 is published. Capt. Winkler of the German navy succeeded in ascertaining the meaning of the Marshall Islands sea charts after repeated failures. As the islanders are beginning to use European methods of navigation and to discard their own, the knowledge of these charts will probably disappear in a few years. A paper from his pen in the Supplement will therefore be read with considerable interest. A sixth paper by Prof. N. Monroe Hopkins on experimental electrochemistry is published. The subjects discussed are "Faraday's law," "Voltameters," "Experiments with frozen electrolytes," "Heat convection in electrolytic conduction." Dr. Kohnke's paper on the mosquito question is concluded, the present installment being devoted to answering the question "How Do Mosquitoes Transmit Disease?" The usual science notes, electrical notes, and engineering notes appear.

Passage of the New Trade-Mark Law by the Senate.

The Senate has passed Mr. Bonynge's trade-mark bill, and sent it back to the House for the acceptance of a few minor changes. In all likelihood the new law will go into effect on April 1, 1905. This law will work a most salutary improvement in American trade-mark conditions. Particularly important are the provisions which permit the owner of a mark that was not registrable under the old law, because it was descriptive or geographical, to register under the new law, provided the mark has been used ten years.

Furthermore, there is nothing to prevent trade marks registered under the old law from being renewed under the new law six months prior to their expiration. The advantages of this procedure from a legal standpoint are the following: An infringer can be more surely followed and more heavily punished under the new law; and the injunction obtained against him is operative in every circuit court of the United States without a rehearing. The provisions of the law have already been fully discussed in these columns by ex-Assistant Commissioner of Patents Greely, the father of the bill.

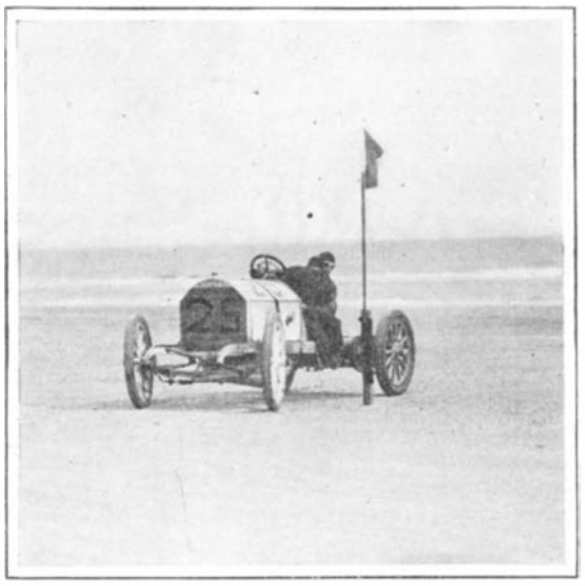
The British War Office has adopted a novel blank firing attachment for machine guns that has been invented by Mr. Ramsay, one of the experts to the firm of Vickers, Sons & Maxim. By means of this attachment, a machine gun can be fired at a very rapid rate without incurring any risk of injury to the barrel or mechanism of the weapon. It also allows the gun to be put through all its various evolutions in slow time in exactly the same manner as when it is discharging automatically, by means of a belt loaded with dummy cartridges, thereby affording a ready means of instruction. With this new attachment it will be rendered possible to discharge some 200 rounds per minute, whereas at present, by using the service blank cartridge and loading by hand after each round, it is impossible to fire more than 60 rounds per minute. It will now be possible for Maxim guns to participate effectively in field maneuvers or field-day exercises, which has hitherto been impossible, owing to the serious disadvantage in loading.

NEW AUTOMOBILE RECORDS AT THE FLORIDA RACES.

Since our issue of last week some of the automobile-speed records there reported have been broken and other records have been made. The greatest feat was the lowering of the mile by Mr. H. L. Bowden, who succeeded in driving his 120-horse-power Mercedes racer that distance in 32 4-5 seconds, or at the rate of 109¾ miles an hour. This reduction of 1 2-5 seconds in the time for one mile by the same machine within a week makes the mile in 30 seconds, or 120 miles an hour, seem not at all a remote possibility. Mr. Bowden's racer, as well as some of the others here mentioned, were illustrated in our last issue. Besides running 100 miles and making seven turns in the Vanderbilt Cup race in the record time of 1 hour, 18 minutes, and 24 seconds, H. W. Fletcher, on Mr. O. F. Thomas' 80-horse-power De Dietrich, made the best time for 50 miles—38 minutes, 58 seconds—in a handicap race for the Burgoyne Cup. A new 10-mile record of 6:15, which is 35 seconds faster than that made by W. K. Vanderbilt, Jr., on a 90-horse-power Mercedes last year, and which represents a gain in average speed of 8 1-5 miles an hour, was made by McDonald on his 90-horse-power, six-cylinder Napier. The average speed was 96 miles an hour, and the record was made in competition. The best 5 miles in competition was done in 3:23 2-5 in the first heat of the race for the Brokaw trophy. This time was made by Mr. E. R. Thomas with his 90-horse-power Mercedes. One of our pictures shows him making the record. He also won the final in 3:30 1-5.

The 20-mile race for the Thomas trophy was also won by McDonald, the time being 15:23, as against Mr. Vanderbilt's 17:02 last year. This is a total gain in average speed of 6.63 miles an hour, the speed attained this year being 77.08 miles an hour. This would indicate that the six-cylinder Napier, although of nominally the same horse-power as the four-cylinder Mercedes that made last year's record, is in reality a much more powerful car. William Wallace on his 90-horse-power Fiat—the car shown making a sharp turn in the 100-mile race—was second in the 20-mile event in 15:34; and Fletcher, whom we also show on his De Dietrich, was third in 15:36 4-5. Sartori on the 90-horse-power Fiat came in fourth in 16:05.

The 50-mile handicap race was won by Sartori, whose 90-horse-power Fiat was given a handicap of 4:50. The time of the winner was 40:20. E. Fredericks on Mr. Shanley's 90-horse-power Mercedes (formerly Mr. Vanderbilt's car and the one with which last year he covered 50 miles in 40:49 4-5) was second in 41:58 4-5. His handicap was 4 minutes, 1 second. Conant on R. E. Jarrige's 45-horse-power De Dietrich, with an 8 minute handicap, was third in 46:25 3-5. Despite the fact that the race was run with four controls at the turns, while last year no stops were made at the turns, a gain in average speed of 3½ miles an hour was made, Fletcher's average speed being 76.98 miles an hour. In the 20-mile race also the turn was neutralized, so that the cars had to make a complete stop and start again; yet the gain in average speed was made despite this fact.

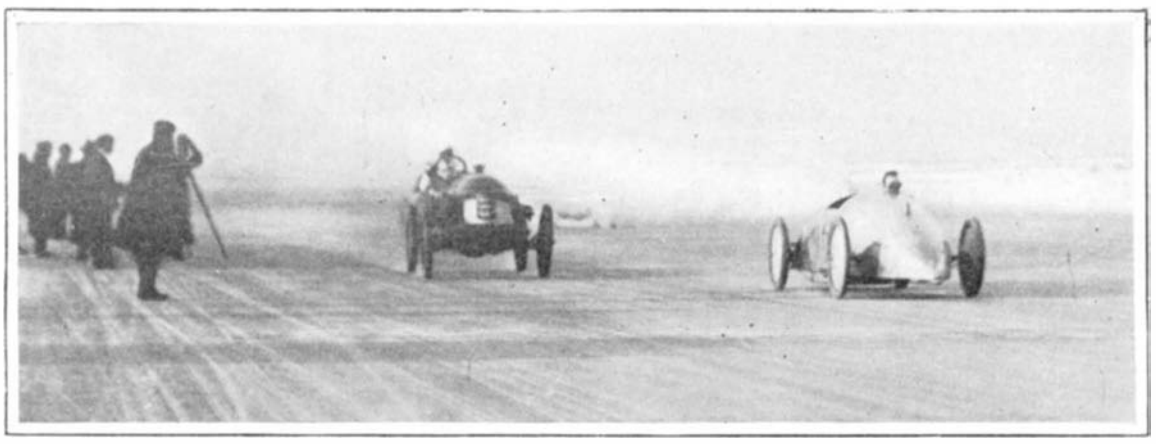


Mr. William Wallace Making a Sharp Turn in the 100-Mile Race for the Vanderbilt Cup.

The 100-mile race for the Vanderbilt Cup was the only one in which the turns were made at speed. In this race an average speed of 76.53 miles an hour was attained. As mentioned above, Fletcher on an 80-horse-power De Dietrich won in 1:18:24, Bernin on a 60-horse-power Renault being second in 1:21:38, and Sartori on a 90-horse-power Fiat third in 1:21:44 1-5. A 90-horse-power Mercedes driven by H. Le Blanc took fourth place in 1:24:28 4-5; and Walter Christie, on his 70-horse-power racer described in our recent Automobile number, fifth place in 1:27:16 4-5. William Wallace, on his 90-horse-power Fiat, lost a front tire 16 miles from the finish, and ran this remaining distance on the rim. Of the other four machines that started, McDonald's Napier punctured a tire at the end of 60 miles and dropped out; Stevens's Mercedes scored a cylinder, which put it out of the running; and an 80-horse-power Pipe car and 45-horse-power De Dietrich stopped with minor troubles.

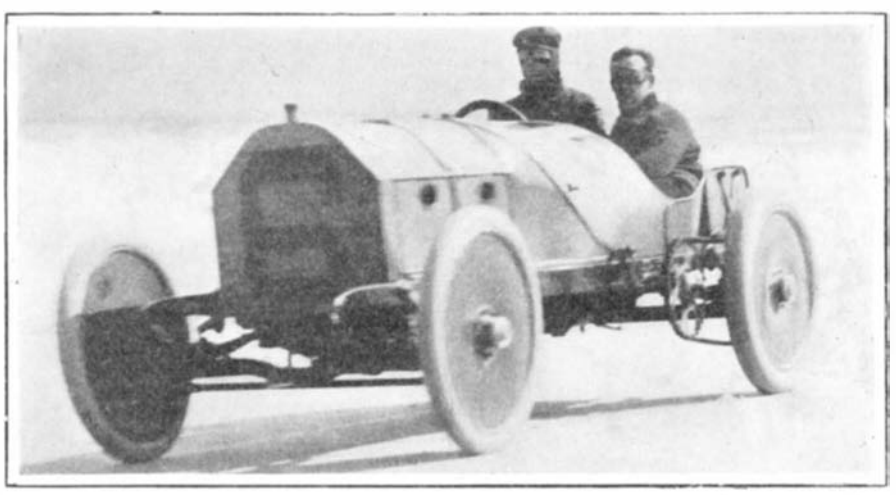
On January 31, the last day of the races, Walter Christie made a mile from a flying start in exactly 40 seconds, which is a new record for American gasoline machines. Besides taking also fifth place in the 100-mile race, Christie's machine won the 50-mile race for American cars, and was the only domestic machine that made a favorable showing throughout the meet, despite the fact that several well-known manufacturers had new and also tried-out racers on the beach.

The automobile races at Ormond were followed by motor-boat races at Palm Beach, in which the racer "Challenger," fitted with a 150-horse-power Simplex eight-cylinder engine, covered 4 miles in 8 minutes, 41 2-5 seconds (27.61 miles an hour) the first day, one mile in 2 minutes, 11 2-5 seconds (27.39 miles an hour) the second day, and 8 miles in 16 minutes, 33 seconds (29 miles an hour) the third day, which is the fastest time made up to the present with a motor boat, being 0.58 mile an hour faster than the time made by the 60-foot, 175-horse-power motor boat "Onontio" on the Hudson River last fall. The "Onontio" covered one nautical mile in 2 minutes, 26 seconds, which is equivalent to 24.66 knots per hour. or 28.42 statute miles. A picture of her at full speed appeared in our November 19, 1904, issue.



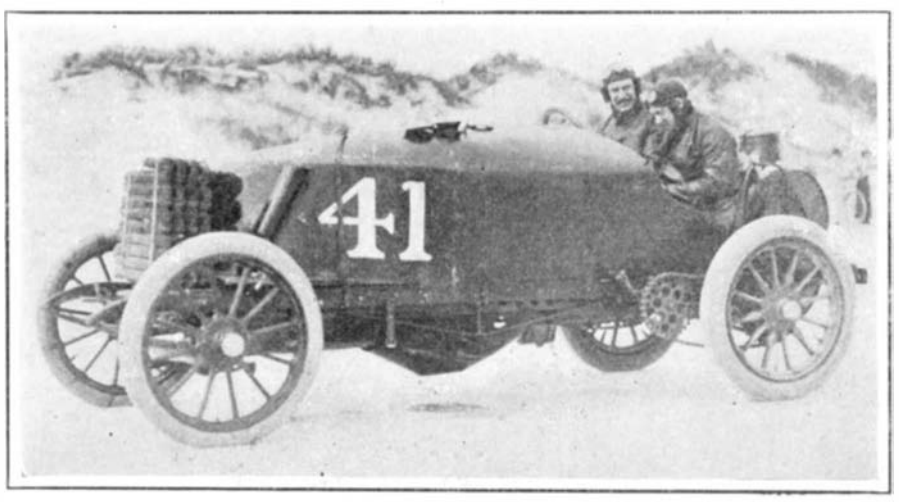
Ross' Steam Torpedo Winning the Mile Race for the Dewar Cup from the 90-Horse-Power Napier Car by 3-5 of a Second.

The time for the final of this race was 42 seconds; that for the first heat was 41 1-5. Ross also made a record mile and kilometer in 38 and 24 seconds respectively.



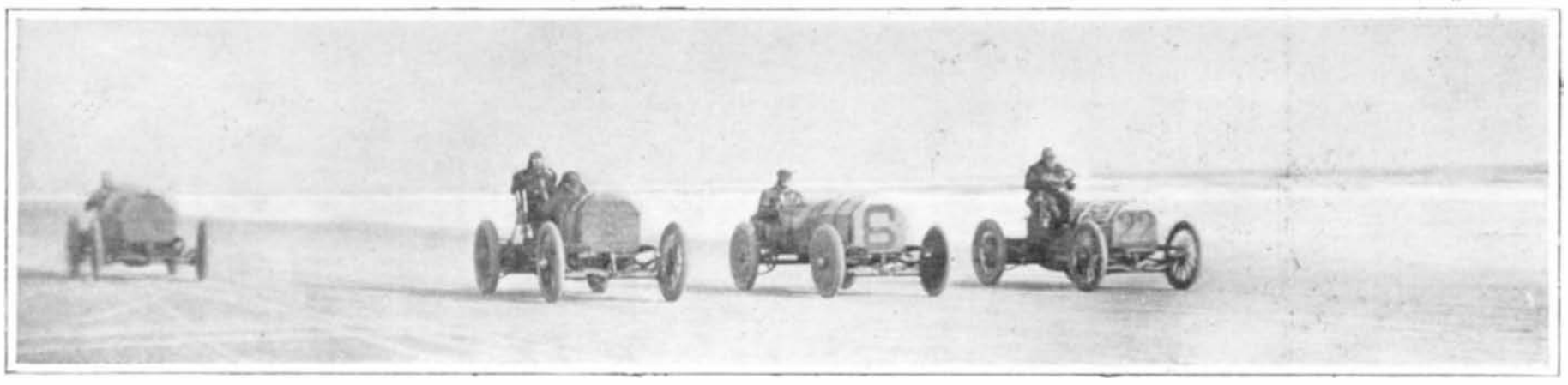
Mr. E. R. Thomas Winning the Brokaw Trophy.

Record: 5 miles in 3 minutes, 23⅖ seconds in first heat and same distance in 3 minutes, 30⅕ seconds in final.



Fletcher on an 80-Horse-Power De Dietrich Racer.

Record: 50 miles in 38 minutes, 58 seconds, and 100 miles in 1 hour, 18 minutes, 24 seconds.



The Start of the Mercedes Racers.

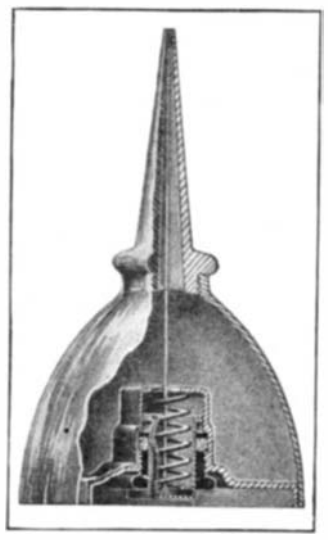
NEW AUTOMOBILE RECORDS AT THE FLORIDA RACES.

Silver Soap.—Cocoanut oil soap, 8 oz.; hot water, 8 fl. oz.; prepared chalk, 16 oz.

Patent Department

OIL CAN WITH MEANS FOR CLEANING THE SPOUT.

Pictured in the accompanying engraving is an oil can provided with a simple means for clearing the nozzle or spout of all obstructions, while expelling the contents. The can is also so arranged that it will positively deliver the oil. The general shape of the can is of the usual type, with the spout screwed into the top of the body portion. The bottom of the can, however, is formed with an inwardly-extending cylindrical chamber, in which a hollow cylindrical plunger is fitted. This plunger, which is open at its upper end, contains a spiral spring that exerts pressure between a plate in the bottom of the plunger and the end wall of the cylindrical chamber. An opening is formed in this wall through which the clearing rod passes. The latter is formed integral with the plate above referred to, and its upper end projects well up into the spout of the can. An oil-tight joint is effected between the plunger and the cylinder, by means of suitable packing, which is held in place and expanded by a gland threaded into the mouth of the cylinder. In use, the oil may be expelled by inverting the can and pressing the plunger inwardly against the spring. This movement will produce a flow through the spout equal in volume to the amount of air displaced by the plunger, and at the same time the movement of the cleaning rod into the opening of the spout will dislodge any obstruction. It should be noted that both the cylindrical chamber and the plunger contain the oil which is within the can, and that as a result the capacity of the latter is only diminished by the space occupied by the comparatively thin walls and the slender rod and spring. the inventor of this improved oil can is Mr. George Palm, of Butler, Penn.



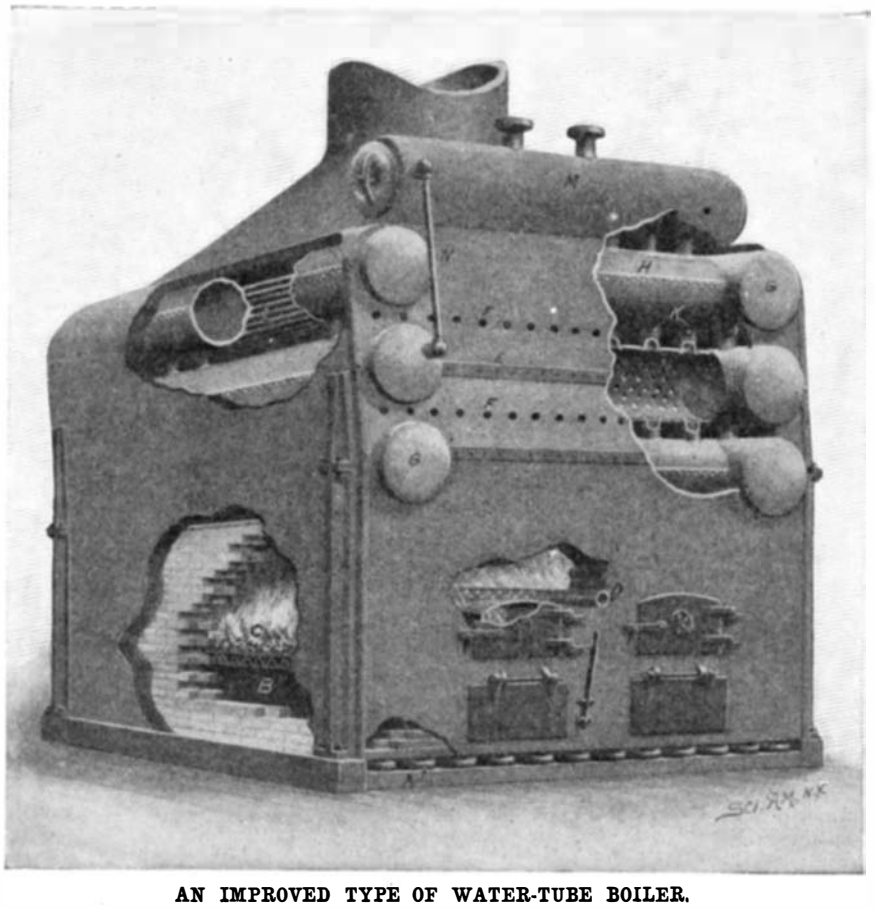
OIL CAN WITH MEANS FOR CLEANING SPOUT.

AN IMPROVED TYPE OF WATER-TUBE BOILER.

In the accompanying engraving we illustrate an improved type of water-tube boiler which has recently been patented by Mr. James M. Colman, of Everett, Wash. The principal objects of the inventor in designing this boiler were to increase the efficiency and at the same time to decrease the cost of manufacture and maintenance. This he effected by means of a new arrangement of the parts. Mr. Colman's boiler, as indicated in the drawing, is quite different from ordinary types of boilers. The boiler foundation may be of any desired construction, but comprises, in addition, a series of water pipes laid in the cement of the foundation to keep the hot ashes in the ash pits from unduly heating the foundation parts and burning out the timbers. These water pipes are indicated at *A* in the engraving. Above the water pipes is a layer of bricks which forms the bottom of the ash pits, *B*. The usual shaking grates are indicated at *C*. The two furnaces and ash pits are separated from each other by a central brick partition, which extends upward a short distance above the grates. Along the top of this partition a perforated pipe, *D*, is laid, through which air is admitted to aid the combustion. The iron casing of the boiler is supported by columns at the corners, and is furnished with asbestos lining. Longitudinal seams are provided on the outside of the front plate, as shown at *E*, arranged for easy access in case of repairs. The casing is also formed with a series of holes, *F*, through which the soot may be blown out. Each hole has a short piece of tube expanded into it and projecting out of it. A cap covers the end of the tube and may be easily removed when it is desired to blow out the soot.

The boiler system comprises a tier of large tubes or drums, *G*, at each side, and these at the front and back of the boiler are connected by similar tubes or headers, *H*. The headers and side tubes are joined together by series of short tubes, *K*, as shown. The water tubes of the boiler, which are indicated at *L*, are inclined and extend from back to front, being expanded into the headers at each end. Upon the top of the boiler is the steam drum, *M*, which is connected to the uppermost header by a series of tubes. The water-gage glass is shown at *N*. The headers and side pipes of the boiler, which are of the same size, are large enough to permit a workman to enter when it is desired to effect repairs. Entrance may be had through the manhole provided at the rear of the side pipes. The joints of the water tubes are thus laid open to inspection. Similarly the steam drum, *M*, may be entered through the manhole, shown at the left-hand end.

As will be observed by studying the engraving, the boiler is very compact and the construction is very strong. The large side pipes intersecting with the headers serve to brace the parts, obviating the necessity of staybolts. There are no hand-holes to weaken the structure, nor are any threaded joints used, the parts being connected by expanded joints, and the seams being riveted. The large side pipes and the headers not only give complete and ready access to all parts of the boiler for cleaning and repairs, but also, owing to their large capacity, they permit the boiler to carry a larger quantity of water than forms heretofore known, thereby securing more steady steam and obviating the danger of burning out the water tubes. Perfect facility is obtained for separating water from steam, yielding a dry steam, and thereby insuring economy. The circulation of the boiler is very good and is ample to carry off all the steam generated. Expansion in the inclined water tubes, *L*, causes an upward flow toward the front headers, the return flow taking place through the side pipes. The circulation is greatly assisted by the series of short tubes, *K*, which connect the tiers of headers and side pipes together. The openings, *F*, are also important, as they provide convenient means for cleaning out the soot collected on the pipes without removing any of the plates of the boiler casing. But if at any time it may be desired to effect an entrance therein, a plate may be removed from the front of the boiler by opening the seams, *E*. The construction provides a large grate area and the grates may be adapted to burn any kind of fuel. No special fittings are required that must be obtained from the manufacturer, so that any boiler-maker can repair the parts.

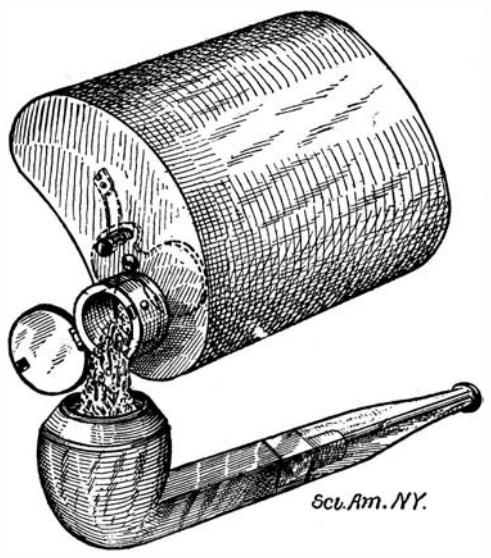


AN IMPROVED TYPE OF WATER-TUBE BOILER.

Experiments have been carried out by the British Admiralty with a new type of collision mat, which is the invention of Messrs. Speeding & Co., Sunderland, with very satisfactory results. The device was placed over an inlet orifice of one of the dock caissons, having a head of water over it of 12 feet to a pressure of 6.68 pounds per square inch, while the inlet valve was open, the water passing freely through the 2-foot orifice. Immediately the mat was applied to the orifice the flow of water was completely stopped. The tests are to be repeated when one or two alterations in the device, which were seen to be essential, have been carried out.

ODDITIES IN INVENTIONS.

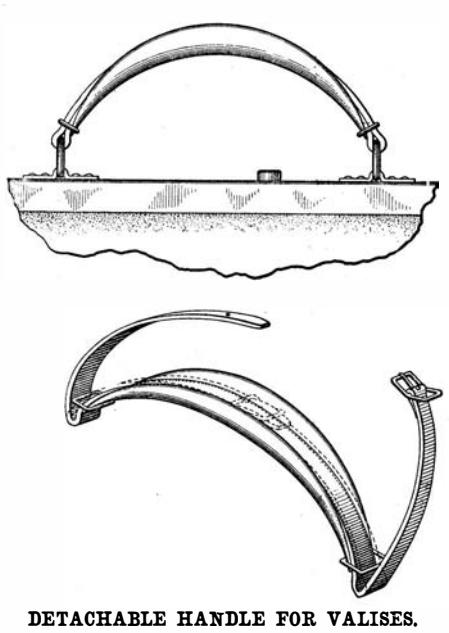
An Improved Tobacco Pouch.—A Californian has invented a rather novel tobacco pouch, which we illustrate herewith. The pouch is provided with a measuring device which will measure off a quantity of tobacco necessary to fill a pipe, or to make a cigarette.



TOBACCO POUCH WITH MEASURING DEVICE.

This measuring device consists of a cylinder formed at the upper end of the pouch. This cylinder is covered at the top by a lid which is kept closed against the pressure of a spring-actuated hinge, by means of a spring latch. A sliding plate is provided within the pouch to close the lower end of the cylinder. This plate may be operated by a thumb piece, projecting through the upper wall of the pouch. In use the plate is moved clear of the cylinder, and the pouch is inverted to fill the cylinder with tobacco. Then the plate is moved to closed position, and the lid is released, causing the measured amount of tobacco to flow out into the pipe. The measuring chamber thus prevents waste. The pouch is particularly useful for smokers who make their own cigarettes. When adapted for that purpose the cylinder is made of a size to measure just the quantity of tobacco necessary for a single cigarette.

Detachable Handle for Valises.—The handles of valises, traveling bags, and the like, which are subjected to long and continued use, or to rough treatment, are very apt to wear out and break at a most inopportune time. The ordinary type of valise handle is a rather difficult thing to apply, and requires the use of special tools. But a new type of handle has just been invented which may be quickly applied by anyone without tools. It comprises a body part made of padded leather, and formed with a central depression in its upper face to receive a strap which is stitched thereto. The ends of the strap are passed through the rings on the valise frame, and then buckled together at the top of the handle. A couple of metal retainers serve to hold the straps in the groove of the handle piece. Since the buckle rests in this groove, the hand is prevented from coming in contact therewith and being bruised by the metal parts while the valise is being carried. It will be observed that neither sewing nor riveting is necessary in applying the device, and that both time and expense are saved thereby.



DETACHABLE HANDLE FOR VALISES.

RECENTLY PATENTED INVENTIONS.

Electrical Devices.

TROLLEY.—G. H. TUTTLE, Shorter, Ala. In this case the invention relates to improvements in trolleys for engaging with overhead wires of electrically-operated railway-cars, the object being to provide a trolley of simple and novel construction that may be readily engaged with a trolley-wire or removed therefrom and that when in connection with a wire will be secured from accidental displacement.

ELECTROMAGNETIC TRACTION DEVICE.—G. W. THOMPSON, Melrose, Mass. In its simplest form Mr. Thompson's invention consists of means for producing a magnetic pull at a point upon the periphery of a wheel of ferruginous material at the place of contact between that wheel and another wheel engaged thereby. He seeks to give the magnetic pole its greatest intensity at the point where the contact takes place between the wheels. The invention is of peculiar value in any machine where the desired change in speed rotation is greatest on account of economy of space and absence of added friction upon bearings—as when belts are used.

SHEATH FOR TROLLEY-WHEELS.—S. JURADO, New York, N. Y. One purpose of the inventor is to provide a sheath and a pivotal support on the sheath, through which support the bearings of the trolley-wheel extend. Another, is to provide springs at opposite sides of the support, connected with the sheath, whereby the wheel is held normally in longitudinal alinement with the sheath and whereby the springs will permit the wheel to move to right or left, as direction of the trolley-wire may demand, the springs acting automatically to restore the wheel to normal position in longitudinal alinement with the sheath as soon as a straight stretch of wire is reached.

Of Interest to Farmers.

HAY-SLING.—C. R. SCHULTZ, Poynette, Wis. The aim of this improvement is to provide a sling which may be easily and quickly dismembered, so that the contents of the sling may be dumped whenever and wherever desired. A further aim is to so construct the device that it may be expeditiously handled and so that all the parts may be quickly assembled for use.

COTTON-CHOPPER.—T. J. LOWRY, Mountairy, N. C. This invention relates to machines used for the cultivation of cotton-plants and removal of weeds from rows of growing cotton or other plants, and has for its object to provide novel details of construction for a machine of the character indicated that afford a conveniently-operated device which may be altered in adjustment quickly to put it into or out of service, while the machine is being progressively moved and also to change the depth of the cultivator-blades in the soil to suit the needs of the service.

COTTON-PICKING MACHINE. — J. C. GROVES, Selma, Ala. The improvement has reference more especially to pickers or harvesters which are both hand-supported and hand-operated; and one of the principal objects thereof is to overcome numerous objections common to many contrivances devised for similar purposes. A further object is to provide a machine comprising few parts and one easily operated to pick or harvest cotton without injury to the unopened bolls on the standing plants in the field.

Of General Interest.

BRIDLE-STRAP FOR UPRIGHT-PIANO ACTIONS.—J. AMMON, New York, N. Y. Bridle-straps as heretofore used were usually made of a piece of tape reinforced at one end by a piece of leather, and the reinforced portion was provided with an aperture for engagement with the point of the bridle-wire. The leather of the reinforced portion in time became hard and brittle, and hence readily broke at the apertures and weak portion. With this improvement the defect is overcome and a durable non-apertured strap is produced which can be readily fastened in position on the bridle-wire.

APPARATUS FOR TREATING WOOL-WASH WATERS.—G. E. BEHRENS, Ivoryton, Conn., and G. TAYLOR, New York, N. Y. The improvement of these inventors relates to an apparatus for treating waters or "suds" obtained in the scouring operation of wool for the purpose of eliminating grease or fat, dirt, and other impurities. One object is to provide a form of apparatus wherein the refuse-laden liquid from wool-scouring machines may be treated by proper chemical agents in an economical and relatively expeditious manner for the purpose of filtering the impurities from the water and for separating fats and grease from dirt or other refuse.

OIL-PAINT.—M. HERISSON, 8 Rue du Sentier, Paris, France. In this instance the invention has relation to improvements in the manufacture of oil-colors, more particularly in view of obtaining a white color or paint which is unalterable in air and in water, salubrious to use, covering well the surfaces of a smooth aspect, mixing with any and every color without changing the tints, and doing away with minium for painting on iron.

SLIDING-DOOR HANGER.—G. VOGT and J. MILLER, Covington, Ky. The Messrs. Vogt and Miller invention is an improvement in sliding-door hangers or supports, and especially in the devices for holding the door of the car, the invention having for an object among others to provide a novel construction in the form of a support for the lower end of the door adapted to slide on the rail at the base of the doorway of the car.

WATERPROOFING AND PROCESS OF MAKING SAME.—H. PASCHKE, New York, N. Y. The prime object of this invention is to provide a system by which tunnel-walls may be rendered thoroughly waterproof without use of heat generated in any manner. To this end a waterproof covering is provided formed of sheets of fabric or the like saturated and coated with waterproof substance and united in a cold state by causing the waterproof substance of all the sheets to amalgamate into homogeneous mass by applying a cold solvent to the waterproof substance with which the sheets are coated. This solvent is combined with the basic element of the waterproof substance with which the sheets are saturated, so as to control the solvent and insure its proper action without employment of heat.

SHOE-LACE.—G. H. NICHOLLS, Galveston, Texas. The object of this invention is to provide an improvement in shoe-laces, such as ordinarily tied and fastened in bow-knots. Much annoyance is commonly experienced by wearers of shoes provided with this form of lace by the knots tending to become loose and untie in consequence of the friction of the bows of the knots with the edges of skirts or trousers. Mr. Nicholls has devised a lace which may be quickly tied and so securely that it cannot be loosened accidentally.

SUPPORT FOR PICTURE-FRAMES, ETC.—J. MOHLBERG, New York, N. Y. It is the purpose of this inventor to provide a support for picture-frames and similar articles arranged to allow of moving the supporting member into an active position for supporting the article upright on a table, shelf, floor, or other surface and to permit of conveniently swinging the supporting member into an inactive folded-up position for shipping the picture-frame in compact form.

FOLDING BOX.—J. R. MEDLEY, Atlanta, Ga. Mr. Medley's invention relates to collapsible pasteboard boxes, such as are used by milliners and other persons for holding ladies' hats and other articles of merchandise. The object is to provide a box arranged to fold up flat for convenient storage and shipping and to allow the user to readily extend or set up the box for filling the same with articles of merchandise.

HEATING COMPOSITION.—E. KAFKA, New York, N. Y. This invention relates to the retention of heat and emitting it for long periods. The inventor has discovered that by the use of a composition of two or more of certain crystalline salts a great increase in utility and effectiveness is produced, a higher temperature can be reached, the heat may be retained for much longer periods, at the same time much smaller amounts of material are required and other advantages will result. If a receptacle be provided with such a composition and heated until all ingredients are melted, a source of heat is obtained which remains at gradually-lowering temperature until they are recrystallized.

CLAMPING DEVICE.—A. J. WEED, New York, N. Y. The objects of this invention are to clamp flat plates or other articles firmly in position relative to each other, to permit turning them to present different edges to the operating position without danger of slipping, to hold them in any number of predetermined positions, and at the same time to provide a gage for use when anything is to be applied to the articles operated upon.

Hardware and Tools.

NAIL-PULLER.—H. L. FISH, Eau Claire, Wis. In operation when the parts are in full-line position the operator clasping the handle at the top of the main bar may push said bar to bring the parts to a position when the claw proper will engage with the head of the nail. He may now pull back on the upper end of the bar, bringing it into contact with a stop to tip the claw and its carrier to the position for drawing the nail. The bar projects below pivotal connection with the carrier, so that the lower end of the bar may be crowded against the box in forcing the claw into engagement with the head of the nail.

Household Utilities.

WASHBOILER.—J. E. FAUCETT, Kenmare, N. D. In the use of this apparatus the clothes are placed in a vessel and the latter lowered in the water of the tank. To remove the clothes from the tank, the vessel should be elevated sufficiently and secured for draining purposes. When the clothes are drained, the suspending-chains may be wound on the shaft, elevating the vessel, the latter being adjusted as just described, with its chains wound on the shaft. The shaft may be utilized as a handle adapted to be grasped, and thereby facilitate handling of the vessel with hot wet clothes contained therein. When the boiler is not in use, the standards may be compactly folded within the tank and its cover arranged in place.

MATCH-BOX HOLDER.—O. C. LUTHER, 24 Grafton Street, Brockton, Mass. It is the object of this inventor's improvement to provide a match-box holder more especially designed to receive and hold a box of parlor, safety, or other matches in such a manner as to project the matches beyond the box for convenient withdrawal by the user and to utilize the drawer of the box of matches as a receptacle for the burned matches. The device can be cheaply manufactured.

DIVAN FOLDING BED.—W. THOMPSON, New York, N. Y. The invention refers to folding beds, the more particular object being to produce such a bed suitable for use as a divan, and in which no particular crowding of the mattress occurs when the same is folded. It is not necessary, therefore, to use a so-called "broken-back" mattress, as a high-grade mattress of ordinary construction may be employed without any special effort being necessary to bend it in the middle. All parts of the device are maintained in symmetrical relation and this prevents one part of the mattress from being depressed relatively to another part thereof when the mattress is folded.

Machines and Mechanical Devices.

FURNACE FOR ROASTING ORES, ETC.—W. W. TOBEY, Iola, Kan. Mr. Tobey's invention has reference to kilns for roasting ores and the like, and relates to that type of kilns in which the furnace proper is divided into two parts for the purpose of allowing rakes or agitators to pass longitudinally through the furnace.

LADLE MECHANISM.—J. C. MCCOY, Metuchen, N. J. Among other objects this inventor attains: First, a provision for adjusting the ladle so as to maintain the same approximately level, thus facilitating the casting of copper as rapidly as possible when it has attained the proper pitch; second, a saving of time by handling the copper very rapidly; third, pouring the copper from a plurality of spouts at the same time under conditions otherwise offering more or less difficulty.

DREDGE.—J. HENDERSON and H. G. PEAKE, Oroville, Cal. The dredge is adapted for the raising of gold-bearing sands and similar operations. As apparatus of this class is usually operated there is much relative movement or slipping between buckets and supporting-wheels, which causes the coacting surfaces to wear quickly and shortens life of the parts. The engagement between the corrugated faces will compel the elements to move together, greatly reducing wear, and what occurs is received by readily-removable plates, replaceable at slight expense. Toothed engagement between buckets and rolls compels the latter to move with the former at same rate and avoids danger of rolls becoming stuck, and thus becoming stationary and wearing the buckets and themselves into flattened sections.

Prime Movers and Their Accessories.

ROTARY ENGINE.—I. F. PARMENTER, Berlin, Mass. In the present patent the invention has reference to rotary engines, Mr. Parmenter's more particular object being the production of a type of reversible engine possessing certain advantages in the distribution of the steam. In carrying this out the inventor has produced a novel mechanism for accomplishing the indicated purpose.

DROP-FEED FOR LUBRICATORS.—E. D. MARVIN, Plains, Pa. The object in this invention is to provide a drop-feed for lubricators such as are mainly used on locomotives and other places exposed to the inclemency of the weather, the feed being arranged to prevent the sight-feed tube from breaking and to allow a proper viewing of the lubricant-drops.

LOCOMOTIVE-BOILER.—N. L. WARREN, Macon, Ga. In this patent the object of the invention is the provision of a new and improved locomotive-boiler which is simple and durable in construction and arranged to provide a clear space between the fire-box and the wagon-top unobstructed by stays or the like.

WATER-HEATER FOR LOCOMOTIVES.—W. H. RICHMOND, Marquette, Mich. The water mechanism in the front end of the locomotive is heated in three different ways, first, by the exhaust from the air-pipe into the heater; second, by the flames and waste gases, and, third, by waste heat radiating from the flue-sheet. In the ordinary locomotive there is considerable waste heat at this point, and the principal purpose of the invention is to prevent this waste of heat, thereby economizing fuel. Another object attained, however, is to enable the boiler to raise steam more quickly and also to slightly enlarge the capacity of the boiler.

Railways and Their Accessories.

WASHER.—H. M. WAITT, Chicago, Ill. Mr. Waitt's invention relates to washers, and particularly to those adapted for use in connection with railroad-track bolts and in similar situations where it is important to provide against the nut slackening off under shocks or vibrations. Its principal objects lie in the provision of a simple and secure device of this character.

BRAKE MECHANISM FOR INCLINED RAILWAYS.—S. E. JACKMAN, New York, N. Y. The object of the present invention is to provide a brake mechanism for inclined or pleasure railways arranged to permit the brake attendant at the station to conveniently actuate the brake mechanism in the track to brake and stop a car or release the same, at the same time the attendant being enabled to give full attention to passengers to prevent accidents when they leave a car or embark in the car for a journey over the railway. It relates to a former patent granted to Mr. Jackman.

RAILWAY TRACK AND CAR.—S. E. JACKMAN, New York, N. Y. The invention relates to railways, such as switchback or inclined railways used in pleasure-resorts, exhibitions, and the like. The object is to provide a railway track and car arranged to insure the proper travel of the non-flanged car-wheels of the car on flat rails, especially around curves, without producing undue friction and without danger of the car wheels leaving the flat rails.

CAR-STOPPING DEVICE FOR INCLINED RAILWAYS.—S. E. JACKMAN, New York, N. Y. This improvement has reference to inclined or switchback railways, such as are used in pleasure resorts, exhibitions, and like places. The purpose is to provide a car-stopping device for inclined railways, arranged in case one of the cars breaks down or gets out of order or accidentally stops to stop all the cars on the track, thus preventing the cars from running one into the other.

INCLINED RAILWAY.—S. E. JACKMAN, New York, N. Y. Mr. Jackman's invention refers to switchback or pleasure railways of the kind used at pleasure-resorts, exhibitions, and like places. The intention is to provide certain new and useful improvements in inclined railways whereby a car moving in engagement with the endless traveling chain employed for carrying the car to the summit of the track is not liable to be accidentally bumped or jolted and an easy up-start of the car is had.

CABLE-TRAMWAY SUPPORT AND SHIELD FOR AERIAL RAILWAYS.—C. MESSICK, JR., Hackensack, N. J. One purpose in this case is to provide a shield especially adapted for aerial railways, which is a removable approach-plane, independent of the cable yet resting upon it, and to provide a shield of the above character practicable for long spans and economic with respect to the construction and erection and not tend to lacerate the cable. The detail construction lies in the shield made of two independent parts, one for each direction of the travel of the car; but in the event a track is to be traveled in one direction only the shield is constructed, preferably, in but one part—that is, the part extending toward the approaching car.

SWITCH-OPERATING DEVICE.—W. K. SMITH, Denver, Col. Mr. Smith's invention relates to improvements in devices for shifting switch-tongues on street-railways, an object being to provide a device for this purpose carried by a car and so arranged as to be easily operated by a motorman or driver to shift the switch in either direction while the car is moving. In operation by moving the operating-lever forward the cable will swing the lever in a direction to tilt the frame, carrying the rear wheel or roller downward, so that it will be engaged between the fixed rail and a rib of the shifting-plate, and by moving the lever in the opposite direction the front roller will be moved downward to operating position.

Pertaining to Vehicles.

FRAME FOR MOTOR OR OTHER VEHICLES.—J. DE MONTGOLFIER, 20 Rue des Pyramides, Paris, France. The invention has for its object an improved frame for motor and other vehicles of the same kind. These frames have hitherto been constructed either of reinforced wood or of brazed tubes or of rolled or stamped metal parts. All the component longitudinal or transverse members are assembled one with the other by means of various devices, such as angle-pieces, sockets, lugs, and the like. It permits of dispensing with assemblages of this kind, which tends to increase cost of production, complicate the fitting, and augment the total weight. Mr. Montgolfier attains this by forming the above members by stamping in a single suitably-recessed plate of sheet metal.

DRAFT-EQUALIZER.—J. YOST, Thornville, Ohio. This invention refers to carriages and wagons and concerns itself especially with the draft mechanism. The object is to produce a draft-equalizer of simple construction which will operate effectively at all times, so that the doubletree may accommodate itself to circumstances and distribute the work of hauling between the draft-animals.

Designs.

DESIGN FOR A RECEPTACLE FOR TOBACCO, CIGARS, AND CIGARETTES.—A. Q. WALSH, New York, N. Y. This receptacle for tobacco, cigars, and cigarettes is in the form of a jar of simple and graceful lines, and beautifully ornamented by sprays of leaves with flowers.

DESIGN FOR A FINGER-RING.—I. ROSENBAUM, Mount Vernon, Ind. The design is of a ring open at one side, and ornamented by horseshoes disposed oppositely at the open portions, and presenting an ornamental appearance.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

Business and Personal Wants.

READ THIS COLUMN CAREFULLY.—You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. **In every case it is necessary to give the number of the inquiry.**

MUNN & CO.

Marine Iron Works. Chicago. Catalogue free.

Inquiry No. 6490.—For manufacturers of macaroni, also names of leading manufacturers of machinery in this line.

"U. S." Metal Polish. Indianapolis. Samples free.

Inquiry No. 6491.—For the manufacturer of window screens with the latest improvements.

Perforated Metals, Harrington & King Perforating Co., Chicago.

Inquiry No. 6492.—Wanted, catalogues on machinery illustrating sprockets, chains and wheels; also catalogues with cuts of gear works in spur wheels.

Adding, multiplying and dividing machine, all in one. Felt & Tarrant Mfg. Co., Chicago.

Inquiry No. 6493.—For the manufacturer of handy fruit and vegetable slicers.

Sawmill machinery and outfits manufactured by the Lane Mfg. Co., Box 13, Montpelier, Vt.

Inquiry No. 6494.—Wanted, 50 or 60 tin boxes such as used for ⅛ pound of baking powder.

Leyden Chemical Works. Sole manufacturers of al luminous preparations. 666 East 182d Street, New York.

Inquiry No. 6495.—Wanted, a second-hand gasoline engine of about 1 h. p.

Commercially pure nickel tube, manufactured by The Standard Welding Co., Cleveland, O.

Inquiry No. 6496.—Wanted, a Nicholls steel square with a blade having a table for roofs and the tongue being 1¾ x 16 inches.

Wanted a man to sell a good patent, good pay, references required. A. M. Edwards, 423 Fourth Avenue, Newark, N. J.

Inquiry No. 6497.—For the manufacturer of rotary air pumps with a back pressure of five pounds.

Robert W. Hunt & Co. bureau of consultation, chemical and physical tests and inspection. The Rookery, Chicago.

Inquiry No. 6498.—For the manufacturer of gas scrubbers which will eliminate the sulphur from producer gas.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Machine Company, Foot of East 138th Street, New York.

Inquiry No. 6499.—Address of makers of rolled pinions made of steel about ¼ inch diameter with about 15 teeth.

I have every facility for manufacturing and marketing hardware and house furnishing specialties. Wm. McDonald, 190 Main St., East Rochester, N. Y.

Inquiry No. 6500.—Address of some of the best cement building block manufacturers.

We manufacture anything in metal. Patented articles, metal stamping, dies, screw mach. work, etc. Metal Novelty Works, 43 Canal Street, Chicago.

Inquiry No. 6501.—Address of firms making screw cover tin cans.

The SCIENTIFIC AMERICAN SUPPLEMENT is publishing a practical series of illustrated articles on experimental electro-chemistry by N. Monroe Hopkins.

Inquiry No. 6502.—For manufacturers of gas producing apparatus suitable for heating and power.

PATENT FOR SALE.—A simple cuff holder that meets with ready sale. Can be manufactured very cheaply and leaves big profits. Address J. Jungbauer, 268 Carroll Street, St. Paul, Minn.

Inquiry No. 6503.—For manufacturers of vases, pedestals, flower garden urns.

Manufacturers of patent articles, dies, metal stamping, screw machine work, hardware specialties, machinery and tools. Quadriga Manufacturing Company, 18 South Canal Street, Chicago.

Inquiry No. 6504.—Address of sheet metal workers of ornaments and such, and those who carry casted work of iron, ornaments for cemetery work and some for office fixtures and some for yards.

WANTED.—Revolutionary Documents and Autograph Letters Prints, Washington Portraits, Eighteenth Century Illustrated Magazines and Books, Early Patents signed by Presidents of the United States. Valentine's Manuals of the early 40's. Correspondence solicited. Address C. A. M., Box 773, New York.

Inquiry No. 6505.—Address of firms who handle artificial flowers such as hanging baskets; also address of plaster of Paris workers.

WANTED, novelties to manufacture. The Mitchell Mfg. Co., Portsmouth, Ohio, manufacturers of specialties. Ideas developed. Inventions perfected and made patentable. Experimental work a specialty. Designs and models made. Manufacturers of slot machines of every description and wooden and metal novelties. Light machinery of all kinds.

Inquiry No. 6506.—For manufacturers of machines for utilizing water with automatic steam pump and air pressure.

U. S. Patent No. 779,301 on a pipe wrench, good investment, sale rights to purchaser.

Address F. U. McNabb, Box 296, Parry Sound, Ont.

Inquiry No. 6507.—For the manufacturers of machinery for manufacturing plaster of Paris.

Inquiry No. 6508.—Address of parties knowing the best method of kalsomining and treating gypsum for the manufacture of plaster, such as bleaching and mixing other substances with it.

Inquiry No. 6509.—For the manufacturers of the electrical machine for making puffed rice.

Inquiry No. 6510.—For the manufacturers of self-winding machines.

Inquiry No. 6511.—For the manufacturers of ⅜-inch raw hide belting or leather from which to cut same, also steel or aluminum belt rims (about 20 inches diameter) for above size belt, to attach to rear wheel of bicycle.

Inquiry No. 6512.—For the manufacturers of the "Fairy Floss" candy machine.

Inquiry No. 6513.—For manufacturers of portable compressed air carpet cleaners.

Inquiry No. 6514.—For makers of hand sewing machines for brushes, etc.

Inquiry No. 6515.—For makers of automatic air pumps for gas machines of family size.

Inquiry No. 6516.—For manufacturers of wire bangle rings.

Inquiry No. 6517.—For makers of paper coated with preparation of Mexican soap root, for carrying in book form in the pocket, as a substitute for soap.

Inquiry No. 6518.—For makers of wood alcohol and acetic acid plants.

Inquiry No. 6519.—For makers of shingle-cutting machinery.

Inquiry No. 6520.—For machinery to be used in the turpentine business.

Inquiry No. 6521.—For a machine for making handles in large quantities.

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(9530) O. B. P. asks: I am greatly interested in the articles in the SUPPLEMENT on Experimental Electrochemistry. On reading the article in the December 31 issue of the SUPPLEMENT, it occurred to me that the part water plays in promoting chemical reaction between compounds would also furnish an explanation why water thrown on the flames of a burning building appears to aid combustion in some cases. Does it play the part of a dissociant? A. It is not obvious to us that there is any connection between putting a minute quantity of an electrolyte into a large quantity of water and putting a small quantity of water upon a large fire. In the case of dissociation it is not possible to use the dissociated substance as separate chemical substances. Thus, you cannot get hydrogen and chlorine by dissociating HCl in water. There are H ions and Cl ions in the water, and yet no free H, nor any free Cl. Water is not the substance which is dissociated, but electrolytes are dissociated when a small quantity is added to water.

(9531) A. S. G. says: Would you please answer by letter or through the columns of your paper, if steam turbine engines have ever been used for automobiles? If so, where can I get a description of them? If not, why could they not be used? A. We have never heard of an instance where an attempt has been made to apply a steam turbine engine to an automobile. The speed at which it is necessary to run the steam turbine of small power would make their successful application to automobile practice extremely difficult. The speed control and power at starting also make the steam turbine less satisfactory than the ordinary steam engine for automobile work. The most serious difficulties with the steam automobiles are with the boilers generating the steam rather than with the engines.

(9532) G. A. D. asks: Would you kindly inform me whether it is possible to build a brick smokestack or chimney 150 feet high, either square or round, which will be strictly plumb from top to bottom? A. In reply to your question as to whether it would be possible to make a brick smokestack or chimney 150 feet high, either square or round, which would be *strictly* plumb, we would say that of course it is impossible to make anything *mathematically* straight or plumb. The difficulty of obtaining proper foundation for a tall chimney, and the possibility of unequal settlement, make it especially difficult to have such a structure come as near to the absolute plumb line as many other structures would. It is customary to give the outer wall of a tall chimney a batter, making the chimney smaller at the top that at the bottom, both for reasons of economy and stability.

(9533) J. N. P. says: 1. Why and how does water put out fire? Why does the water have the same effect whether hot or cold? A. Water puts out a fire by reducing the temperature of the flame below the point of ignition, and is especially efficient for this purpose because of the large amount of heat that is required to turn it into steam. It is almost as effective when hot as when cold, because of the great amount of latent heat in the water. 2. Does the sun shining directly on a cooking stove have any effect upon the cooking? Does it lessen the baking in any way? If when shining on a fire in an open grate, does it reduce the heat? A. The sun shining directly on a stove or fire in an open grate tends to increase the temperature slightly, just as it tends to increase the temperature of any other object. The bright sunlight, nowever, may make the fire appear less brilliant, and therefore appear to give out less heat. This effect, however, is deceptive.

(9534) J. B. E. says: What will be the approximate cost of installing an electric light plant to furnish 1,000 16-candlepower lights and run one elevator (exclusive of light charges)? The approximate amount of fuel, coal, for 10-hour run? What horse-power steam outfit required? Is direct or alternating current better for private hotel plant? Is gasoline outfit practical for this purpose from standpoints of economy and reliability? What would be the difference in cost of fuel between steam and gasoline with coal at say $2.50 per ton? Is it practical to use exhaust steam in radiators for heating house? Do you consider underground tank with air pressure preferable to elevated gravity pressure tank for private water-works? A. An electric light plant furnishing 1,000 16-candle-power lights and running one elevator will require an engine which will develop from 100 to 120 horsepower and a generator which would generate from 65 to 75 kilowatts. Such a plant will require from three to six tons of coal per ten hours, according to the type of engine and boiler that are installed. Direct current is as efficient and more simple for your purpose than alternating current, and is perhaps more economical and reliable than gasoline. It is perfectly practical to use exhaust steam in the radiators of a heating plant, and if the installation is properly made, this will give satisfactory results and be a great saving in expense. Either an underground pressure tank or gravity pressure can be satisfactorily used for private water works. Nothing is superior to the gravity pressure.

(9535) H. A. says: A cask of water is placed on a pair of scales. It weighs 50 pounds. If a fish weighing 15 pounds (salmon) is placed in the water contained in the cask, will it raise the weight of the cask or not? It is argued by some apparently smart men, but I want to lay down your word to them as proof. I contend that the cask then weighs 65 pounds. A person weighs 140 pounds before dinner; does he weigh any more after a hearty meal, say of 1½ pounds? It is generally contended here that he does not. I say he does. Who is right? A. If a cask full to the brim with water has a live fish put into it, as much water as the fish displaces will overflow. As a fish weighs the same as the water it displaces when floating in water, it follows that the cask full of water and fish weigh the same after the fish has been put into the water that the cask and water weighed before the fish was put into the water, that is, 50 pounds. If the cask was not full of water when the fish was put into it, and if no water overflowed when the fish was put into the cask, the weight of fish, water, and cask will be 65 pounds in the case you specify. The whole turns upon whether the fish is alive and whether the cask is completely filled with water. If a person is weighed after a meal, he will weigh as much more than he did before the meal as the weight of the food he has eaten. Common sense teaches this. If a person puts 1½ pounds of food into his pocket and gets upon scales he will weigh 1½ pounds more than without the food in his pocket. Write stomach in place of pocket, and you will have the same fact. Or put nails in place of the word food. It will be equally true.

NEW BOOKS, ETC.

JIU-JITSU COMBAT TRICKS. Japanese Feats of Attack and Defense in Personal Encounter. By H. Irving Hancock. New York: G. P. Putnam's Sons, 1904. 12mo.; pp. 151; 32 illustrations. Price, $1.35.

Of *jiu-jitsu* the world had heard much in general, but until the publication of Mr. Hancock's work, very little in particular. Every boy is no doubt eager to learn just how he may master an older and weightier opponent; it is, however, but fair to warn these boys that no little labor and application will be necessary before the simplest of the tricks can be successfully applied. Still, the full-page illustrations are so good that we see no insuperable difficulties in the way of becoming moderately expert.

SCIENCE AND IMMORTALITY. By William Osler, M.D., F.R.S. Boston and New York: Houghton, Mifflin & Co, 1904. 18mo.; pp. 54. Price, 85 cents net.

"If a man die, shall he live again?" So said Job; and this problem has proved to be most interesting since his time. Dr. Osler has conferred a distinct benefit upon those who are desirous of showing the compatibility of science and religion. The book is the Ingersoll lecture of 1904.

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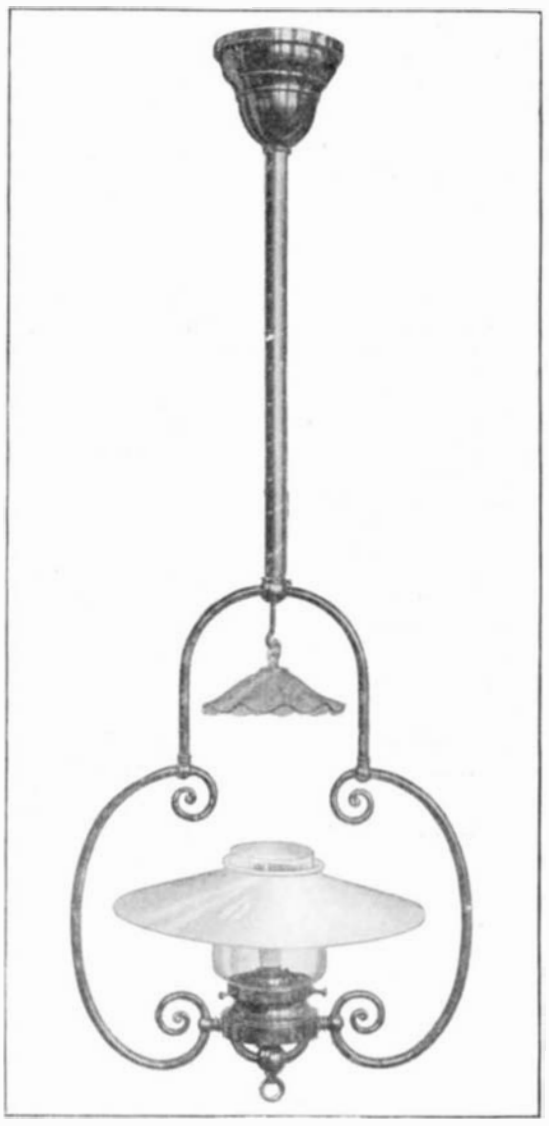
AN IMPROVED INCANDESCENT GAS LAMP.

With the introduction of incandescent lighting in New York city, in 1882, an era of light was inaugurated. The civilized world was no longer satisfied with the kerosene lamp, or even with the gas jet. Inventors turned their attention to the problem of illumination, studied the virtues and defects of the electric light, and endeavored seriously to devise a perfect light, one which should be as steady, as bright, and yet as diffused as daylight, and which should contain all the colors in the same proportions as found in sunlight. For a time it seemed as if gas, long the chief illuminant of city buildings and streets, would be entirely displanted by electricity. But the invention, a few years later, of the incandescent gas mantle opened up new fields for the use of gas. It was possible now to secure a steady, brilliant, white light, closely approaching daylight, and far more satisfactory than the trying, yellow light of the incandescent electric lamp or the unsteady, sputtering glare of the arc lamp. By judicious arrangement of shades and reflectors the light was softened and diffused, so that instead of coming from a small intensely bright crater, as in the arc lamp, the light was spread over a large surface at its source, thus destroying those objectionable sharp, black shadows of the open arc lamp. The resulting effect was, therefore, very similar to daylight. At the same time efforts were made to produce a lamp that would consume a smaller amount of gas per candle power hour. All incandescent gas lamps burn a mixture of air and gas and are consequently more economical than the ordinary gas jet without taking into consideration their higher illuminating efficiency.

But a much greater economy has been provided by the recently invented lamp which we illustrate herewith. In this lamp air is furnished to the burner under compression, instead of being sucked up by the gas current, as in the ordinary Bunsen burner. Of course, there is a limit to the amount of air which it is advisable to mix with gas in order to produce the best results, and it is not the purpose of this invention to overstep this limit. The compressed air expands in the mixing chamber, insuring a more intimate mixture of the air with the gas, and the pressure then drives the mixture with a rapid current to the burner. A more efficient flame is thus produced due to the perfect mixture, and also to the current that rapidly carries away the products of the combustion which hinder the flame.

The air is compressed by means of a simple pump, which may be placed in the cellar or any other convenient place. It takes up about one square foot of floor space, and is operated by the city water power at an expense that is insignificant. We show herewith a diagrammatical view of the lighting system. The city water supply is admitted alternately to opposite ends of the upper cylinder, *A*, of the pump, giving a reciprocating motion to the piston therein. This piston is connected by a rod with a piston in the air cylinder, and the air compressed therein is forced into a galvanized iron tank, *B*, whence it is fed through a small brass pipe to each lamp, *C*. The action of the pump



AN IMPROVED INCANDESCENT GAS LAMP.

is automatic, and requires but little attention. The pressure is governed by a regulator shown at *d*. This regulator reduces the pressure to 3½ pounds, the amount necessary to produce the maximum candle power in each burner.

The lamps used with this system vary in design to suit different tastes. One of the best designs is illustrated by the accompanying half-tone engraving. The gas supply pipe and the air supply pipe are both inclosed by a tube leading down to the main frame of the lamp. The gas passes down the right side of the lamp through the tubular frame, while the air passes down the left-hand side to the valve at the bottom of the lamp. A set screw is threaded into the air channel, just below the point where the air pipe is connected to the lamp frame, and this provides an additional means for regulating the amount of air admitted to the lamp. The details of this valve and the burner will be clearly understood by reference to the sectional view. The valve plug, *e*, is formed with a central channel for the air supply, which enters the mixing chamber, *f*, through a nipple, *g*, while the gas supply branches and opens into the mixing chamber through two ports, one on each side of the nipple, *g*. The valve plug is also formed with an annular groove, *h*, near its upper end, from which a small channel, *j*, connects with one of the gas channels leading into the mixing chamber. This groove is also connected with the main gas channel in the frame of the lamp, by means of a short branching passageway, *k*, which may be closed or opened to any desired extent by means of the set screw, *m*. The purpose of this construction, it will be observed, is to provide a pilot light which can be left burning when the valve is turned off, and which will serve to light the mixture when the valve plug is turned again to open position. In this way the lamp is made ready for instant use without requiring lighting with a match or taper. Whenever it is desired to entirely shut off the gas, the set screw, *m*, may be screwed down, completely closing the passageway, *k*, and cutting off the supply of gas for the pilot light. It will be observed that when the valve plug is turned, both the air supply and the gas supply is cut off. From the mixing chamber the combined air and gas passes up to the burner, where it is ignited. The flame heats the mantle to a brilliant incandescence, producing a pure and steady white light. The incandescent mantle is protected by a large glass globe, which at its upper end supports a wide shade. This shade serves to reflect the light and diffuse its intense brilliancy. Owing to the large spread of the shade, sharp shadows are destroyed; for the light is distributed over a large surface at its source whence it is shed forth in a soft, mellow, white flood of uniform luminosity. The quality of the light approaches very closely to that of sunlight, and makes the ordinary incandescent electric lamp look yellow in comparison. It is a mistake to assume that all incandescent gas mantles give the same quality of light. When insufficiently heated, these mantles give off a light which is little, if any, better than the ordinary gas flame, and the higher the temperature is raised, the richer they become in violet rays, until a pure white light is produced. This maximum temperature, however, cannot be maintained for long without consuming the mantle; but by means of the compressed air employed in this system and the accurate regulation provided, it is possible to maintain a temperature just high enough to produce an almost perfectly white incandescence without impairing the life of the mantle.

One of the lamps, such as we have just described, will yield 500 candle power with ordinary city gas, and this brilliant light, it is claimed, may be produced at the inappreciable cost of one cent per hour. Owing to its economy and high power, this lamp should be found very useful for illuminating dwellings, stores, halls, theaters, and streets of towns and cities. In stores, particularly, this white light should be found invaluable for matching colors.

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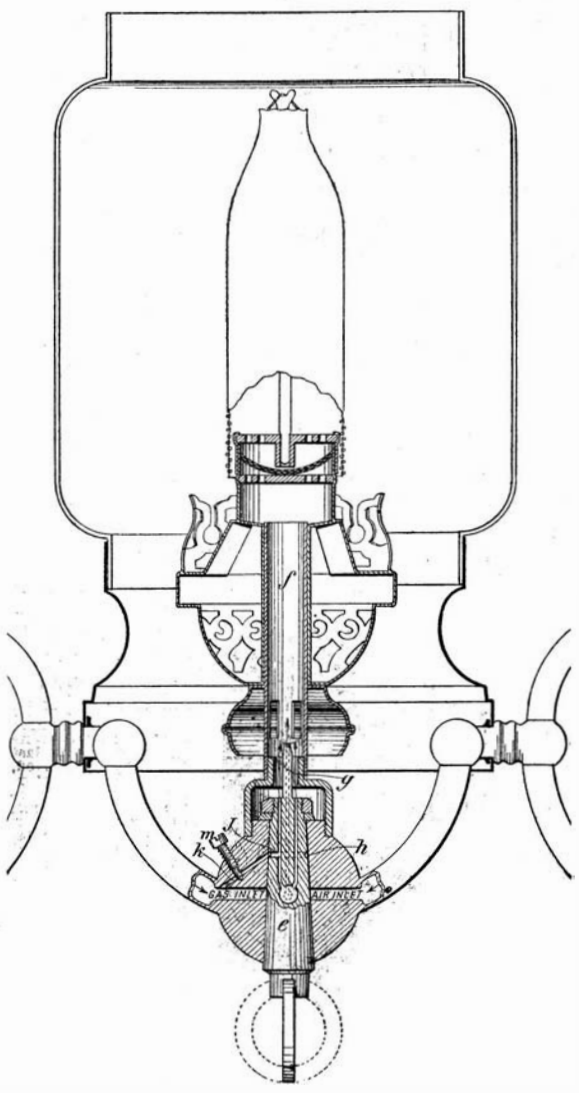
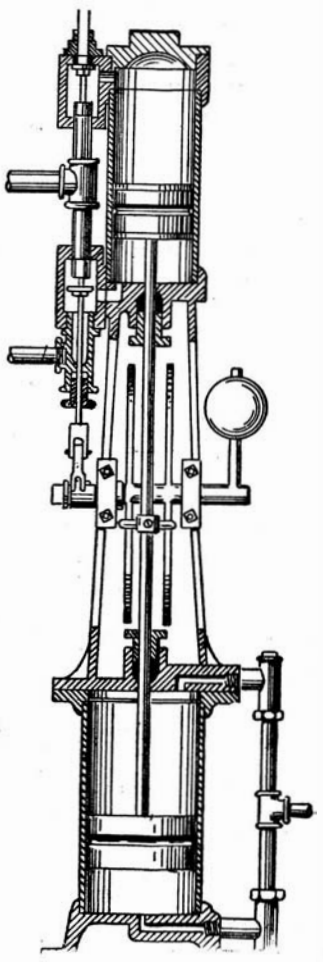
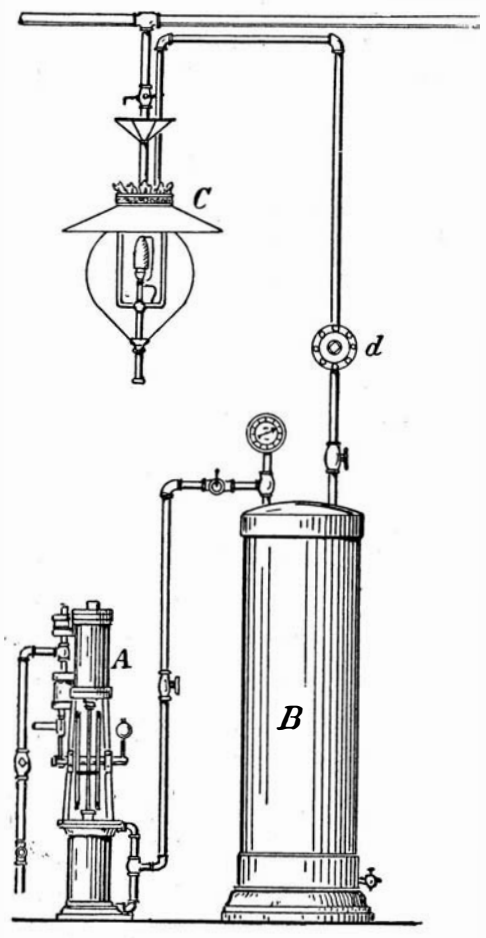


DETAILS OF THE BURNER.



SECTION OF THE PUMP USED FOR COMPRESSING THE AIR.



DIAGRAMMATICAL VIEW OF THE NEW CENTURY LIGHTING SYSTEM.

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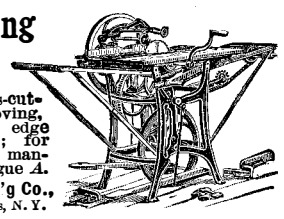

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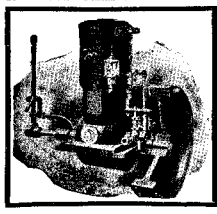

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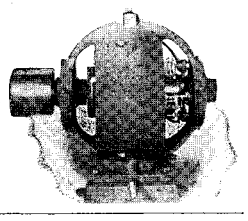

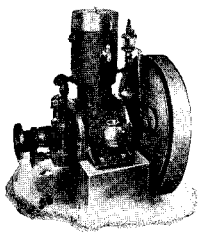

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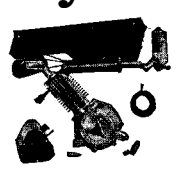

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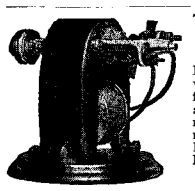

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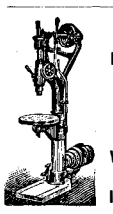

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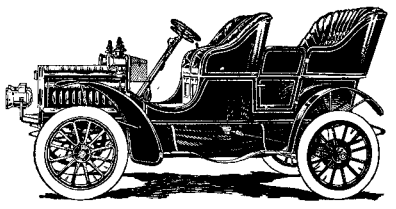

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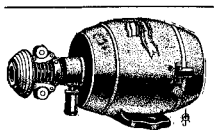

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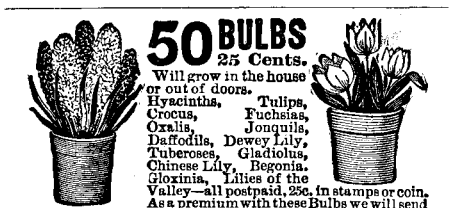

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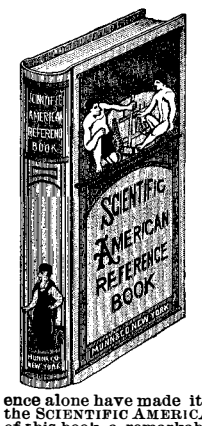

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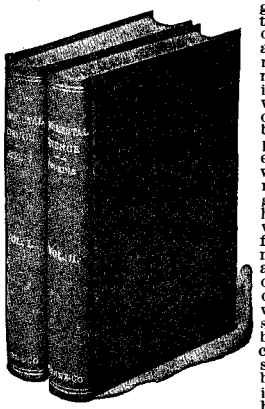

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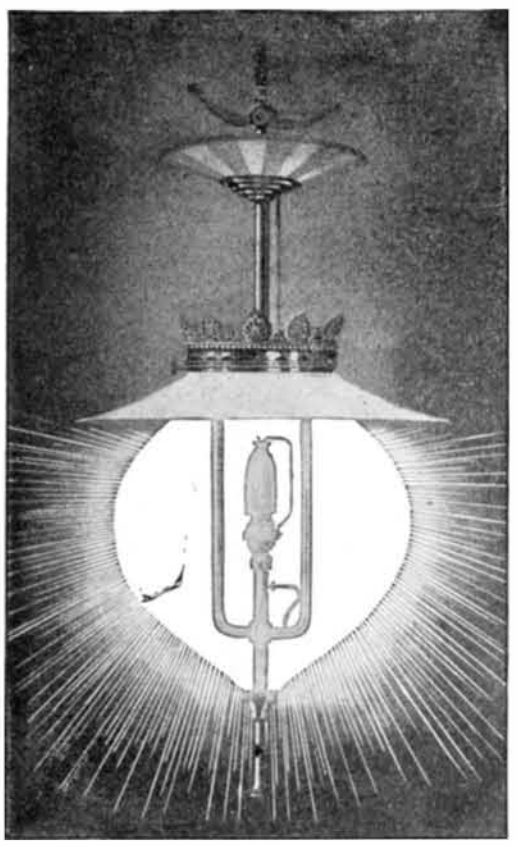

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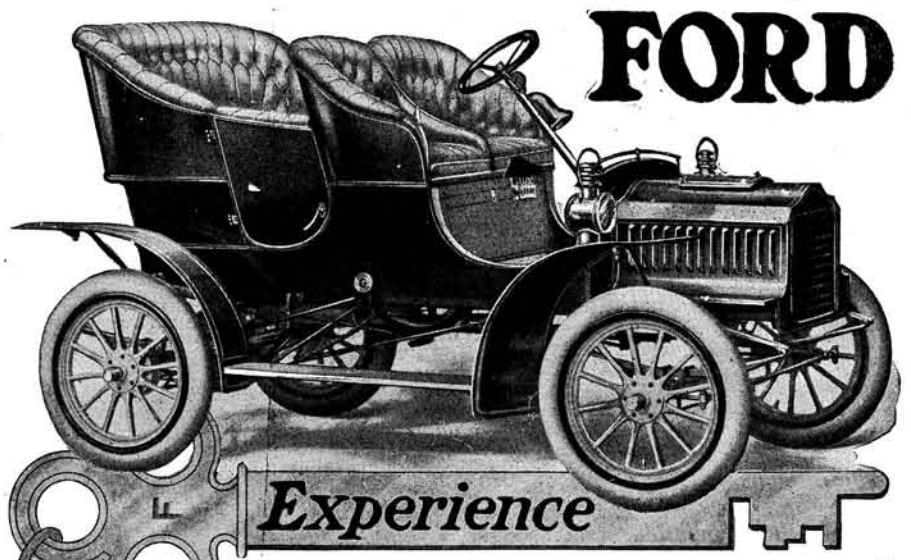

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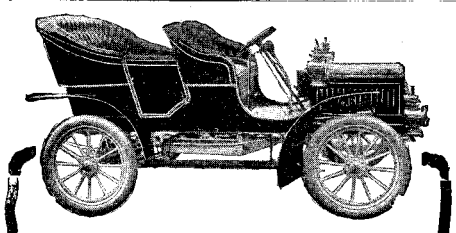

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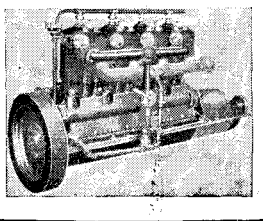

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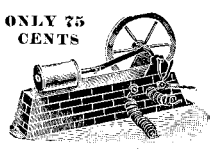

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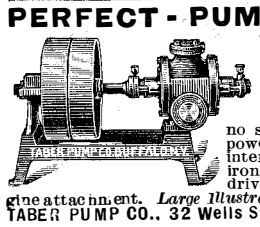

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0.50	per annum	146	324	806	2,588
1.00	compound-	293	650	1,614	5,177
2 00	ing twice	585	1,301	3,228	10,355
5 00	a year	1,462	3,252	8,070	25,888

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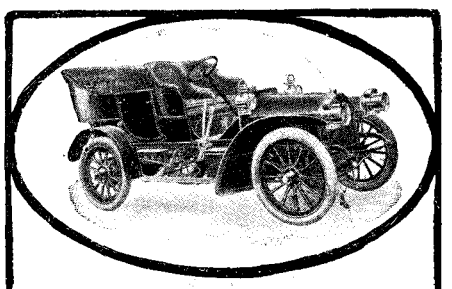

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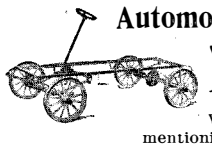

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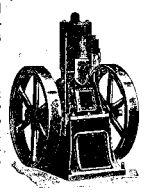

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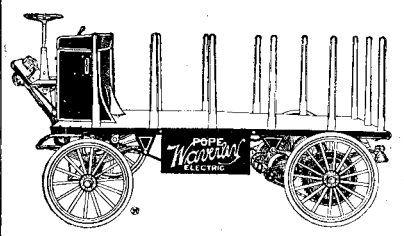

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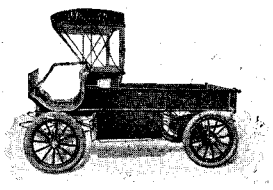

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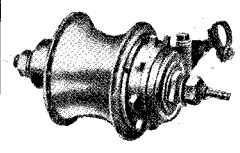

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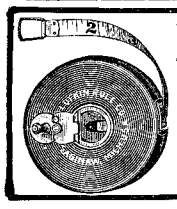

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GOVERNMENT OF BERMUDA.

Tenders for Deepening, Widening and Buoying St. George's Channel.

The Crown Agents for the Colonies, London, England, are prepared, on behalf of the Government of Bermuda, to receive tenders for the deepening, widening and buoying of the Channel leading from sea into St. George's Harbour in the Islands of Bermuda.

The Channel has been surveyed by persons appointed by the Government of Bermuda, and on and after the 25th of January, 1905, a plan, drawing, sections, form of contract and form of tender may be seen daily by intending contractors at the office of the British Consul-General, 17 State Street, between the hours of 11 A. M. and 3 P. M.

On application to the Consul-General and on payment of 20 pounds, persons or firms wishing to submit a tender will receive two copies of the form of contract and form of tender and will be allowed to make copies of the plan, drawings and sections showing the work to be executed under the contract. The above sum will be returned to each person or firm submitting a bona fide tender properly completed in all respects within the time specified below.

Tenders on the form attached to the form of contract must be delivered to the Crown Agents for the Colonies, Whitehall Gardens, London, S.W., not later than noon on Monday the 10th day of April, 1905, in sealed envelopes endorsed "Tender for deepening, widening and buoying St. George's Channel, Bermuda." The draft form of contract and schedule of prices must be sent in with the tender with the blanks in each properly filled in as required by the form of tender.

One of the conditions of the tender is that it must remain open and may be accepted at any time within six months.

The Crown Agents do not bind themselves to accept on behalf of the Government of Bermuda the lowest or any tender, nor will they assign any reason for the rejection of a tender.

The tenders will be communicated to the House of Assembly of Bermuda. The carrying out of the proposed works will depend mainly upon whether after the tenders have been submitted to the Legislature of Bermuda the Legislature decide to proceed with the works.

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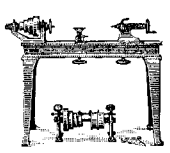

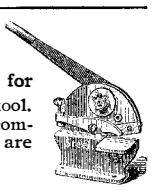

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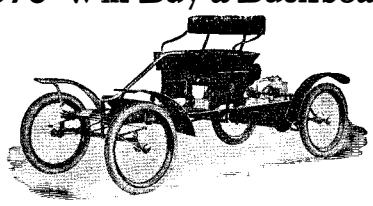

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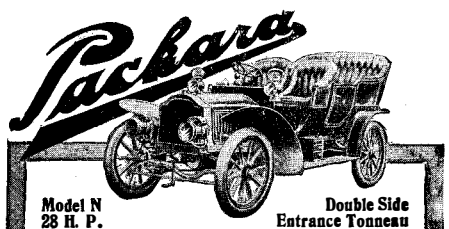

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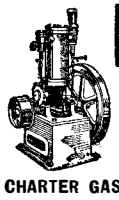

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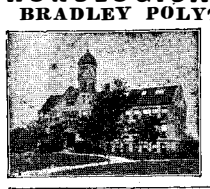

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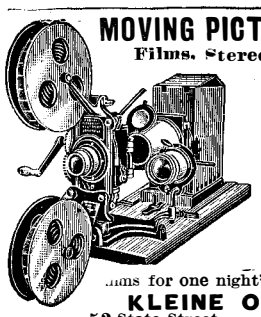

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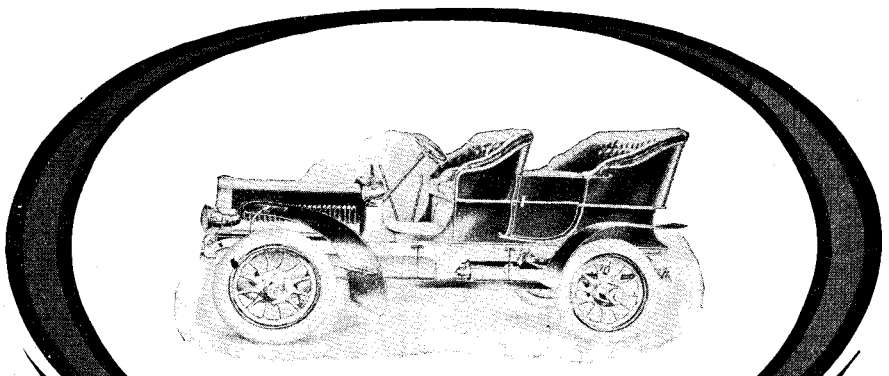

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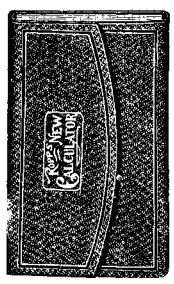

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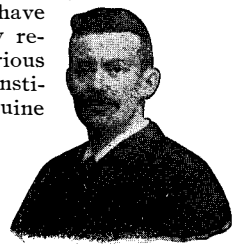

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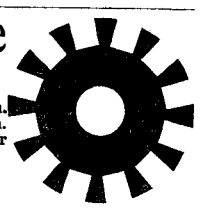

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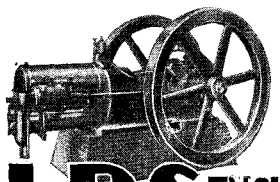

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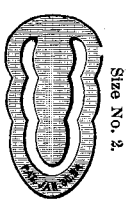

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